THE FOUNDRY

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Castings Separate the Grain from the Straw

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A Common Sight Through the Central West as Threshing Begins

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Find Where Castings Can Be Sold

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Select South for Manufacturing Plant

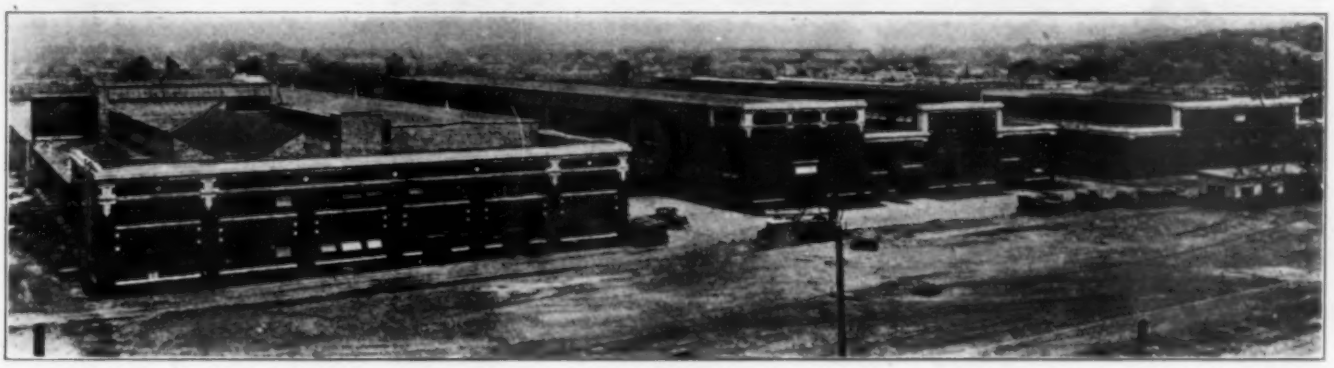


Fig. 1—General view of group of buildings recently erected for the Continental Gin Co., Birmingham, Ala. The fourth unit is being built at the extreme right

REPRESENTING an investment of $1,500,000 the plant just completed at Birmingham, Ala., for the Continental Gin Co. is considered a credit to the company and a harbinger of industrial expansion in the southern states. A total floor space of 500,000 square feet is provided in the nine buildings arranged in four major groups including a foundry, machine shop, boiler house, assembly building, woodworking plant, warehouse, dry kilns, lumber storage and pattern shop.

One of the interesting features of the project and one that probably will be observed more frequently in the future is that one engineering and building firm carried the job through from beginning to end. The service of the H. K. Ferguson Co., Cleveland, began with the selection of a building site and followed through with design and construction of the buildings, installation of railroad sidings, plant layout, selection and erection of equipment, sprinkler system, lights, etc. The plant was handed over to the owner ready to go into production. In fact so well was the work planned and carried out that approximately one half of the plant capacity was engaged in production several months before the entire plant was completed. Ample provision has been made for future expansion.

The Continental Gin Co., first was formed in 1901 by the union of several Southern and New England interests engaged in the production of machinery used in the cotton industry. Two plants were erected in Birmingham, Ala., and one in Atlanta, Ga. Experience gained over a period of many years has justified the early judgment of the company in its selection of a southern location for its manufacturing activities. Decision to erect the new plant in Birmingham was based largely on this experience. The work formerly done in the two Birmingham plants together with part of the work handled in the Atlanta shops in future will be done entirely in the new plant. However, a certain line of machinery still will be manufactured in Atlanta.

A fairly accurate conception of the general outside appearance of the plant may be gathered from the illus-

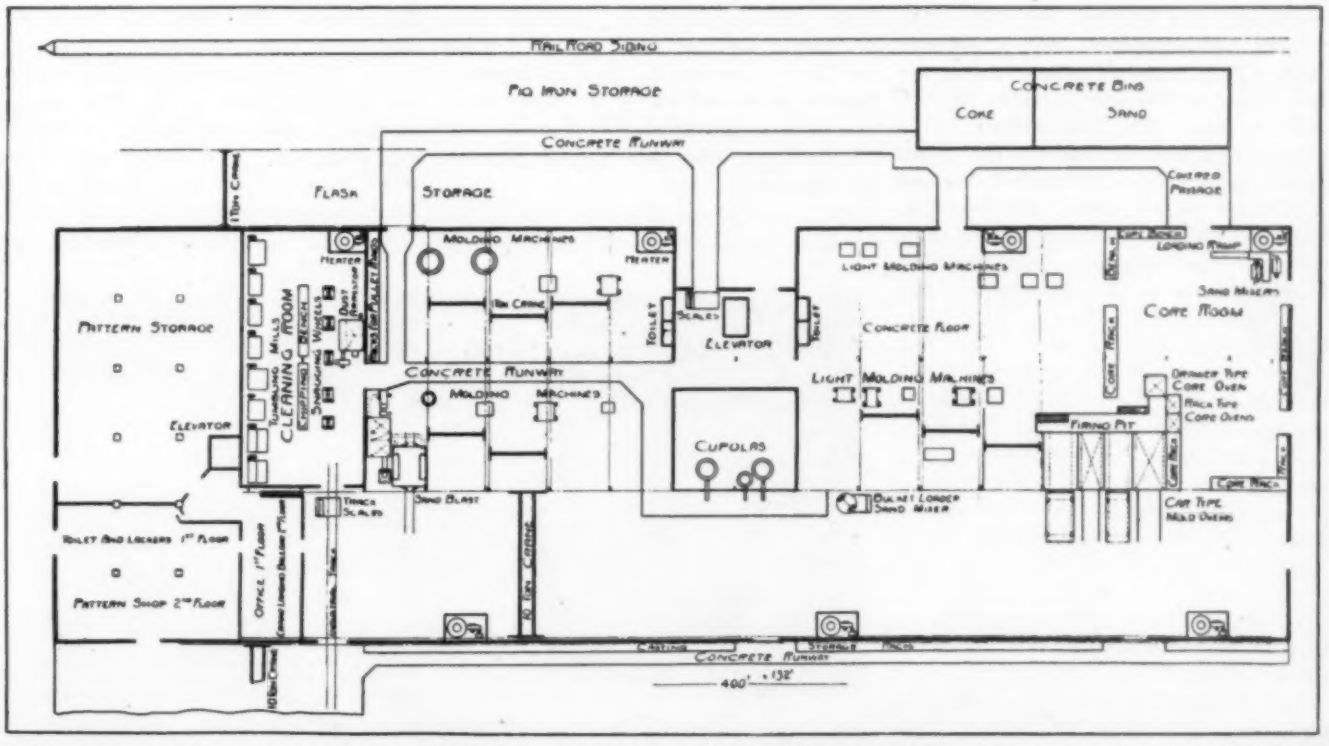


FIG. 2—LAYOUT OF THE FOUNDRY BUILDING SHOWING LOCATION OF VARIOUS DEPARTMENTS AND PIECES OF EQUIPMENT

FIG. 3—WINDOWS IN THE SIDE AND END WALLS AND IN THE ROOF FLOOD THE FLOOR WITH DIFFUSED DAYLIGHT

tration shown in Fig. 1. The layout of the foundry showing the relative positions of the various pieces of equipment is presented in Fig. 2.

Shop Layout

The pattern storage of reinforced concrete construction 60 x 132 feet extends all the way across one end of the foundry building from which it is separated by a wall and suitable fire doors. At present it is a two story building, but the necessary provision has been made for the addition of a third story when conditions warrant. Part of the second story 50 x 60 feet has been fitted up with the usual machinery and equipment for a pattern shop. The foundry office is on the first floor, below and in front of the pattern shop. The roof serves for a storage and loading balcony for large flasks, patterns and loads of lumber in transit to and from the foundry. The material is handled by an elevator in the pattern storage and by a 10-ton crane in the main bay of the foundry.

With a view of reducing the fire hazard the cleaning room 40 x 80 feet is located between the foundry and the pattern storage and is separated from each one by a brick wall that extends to the roof. Heavy castings are conveyed into and out of the cleaning room on an industrial track. Light castings are handled on an electric lift truck. The weight is taken on a track scale located in the main bay of the foundry outside the cleaning room entrance.

The cleaning room is equipped with eight tumbling barrels of various sizes both round and square and with five double stand grinders all piped to a dust arrester. A large sandblast chamber using steel shot as an abrasive is located on the outside of the cleaning room at the corner which touches the main bay. Castings are loaded on a carriage operating on a short track which extends to a point on the floor where the carriage may be loaded and unloaded by the crane. The chamber is 10 x 12 x 7 feet and is connected to a suitable dust arrestor.

Molding Floors

High side walls insure adequate light and ventilation supplemented by a liberal amount of top hung sash in the monitors. Seven pipeless heaters arranged along the sides, four on one side and three on the other side as shown in the plan Fig. 2, furnish all necessary heat.

The core room 60 x 80 feet is located at the opposite end of the foundry from the cleaning room and is separated from the molding floors by a brick wall 4 feet high. It is connected with the concrete sand bins on the outside of the building by a covered passage. The sand is prepared in two revolving paddle type mixers erected in the corner of the core room in the vicinity of the covered passage entrance. Small cores are dried in one drawer and in two rack type ovens. Large cores are dried in a battery of four large car type ovens which open into the main bay of the foundry and which also are used for drying many of the molds made in this department. The ovens are fired with coke from a single firing pit under the floor. It is claimed that coke breeze up to 75 per cent of the total amount of fuel is used successfully in the firing chamber. Two ovens are 7 feet wide, two are 10 feet wide and all four are 16 feet deep by 8 feet high.

Molding floor area is divided into

FIG. 4—THE PATTERN SHOP IS EQUIPPED WITH THE NECESSARY TOOLS TO MAKE AND REPAIR WOOD AND METAL PATTERNS

three sections devoted to the production of three main classes of castings. All the heavy castings are made in one long bay which extends the complete length of the foundry. This bay is served by a 10-ton crane operating on a runway 25 feet above the floor. Facing sand is prepared in this bay in a 6-foot revolving pan mill equipped with a bucket loader. Light castings are made on approximately one half of the remaining floor space shown above and to the right in the floor plan Fig. 2. The floor in this section of the foundry is laid in concrete and the molds are made on a battery of molding machines. Three light traveling cranes handle the ladles in this section, also many of the molds beyond the lifting capacity of the operators.

Melting Equipment

The third molding section shown in the upper center in the illustration is devoted principally to the manufacture of pulley castings of various sizes. This section is equipped with five hand operated overhead cranes. A concrete gangway extending through the center connects this department with the cleaning room to the left and the two remaining molding sections below and to the right respectively as shown in Fig. 2.

Three cupolas erected approximately in the center of the building and with the spouts projecting into the main bay, supply the molten iron. Two of these cupolas 54 inches in diameter are used alternately to melt the greater part of the iron required. The third cupola 42 inches diameter is used to melt special iron for the gin ribs. Iron is distributed by the crane in the main bay and is taken into the other two bays in ladles mounted on electric trucks.

Coke and iron charges are made up in the storage yard between the building and a railroad siding. They are brought to the vicinity of the cupola building and weighed while on an electric truck. Then they are lifted by a hoist with a capacity of 2000 pounds and charged directly into the cupola. A concrete runway extending the full length of the yard and with branches connecting with concrete gangways in the building, greatly facilitates the movement of the trucks employed in conveying material from place to place. The iron is stacked openly in the yard, but the coke is kept in a concrete storage chamber adjoining others containing molding sand and core room supplies.

The machine shop is 150 x 400 feet with a space 30 x 40 feet partitioned off at one end for a blacksmith shop. It is divided into three longitudinal bays and in addition to the regular machine shop equipment is provided with many special tools designed primarily for dealing economically with the product manufactured in this plant.

Manufacturers of Equipment

Air compressor
Ingersoll-Rand Co., New York
Air lifts
Whiting Corp., Harvey, Ill.
Blower
B. F. Sturtevant Co., Boston
Core and mold ovens
Foundry Equipment Co., Cleveland
Cupolas
Whiting Corp., Harvey, Ill.
Dust arresters
Pangborn Corp., Hagerstown, Md.
Electric cranes
Harnischfeger Corp., Milwaukee
Electric lift trucks
Automatic Transportation Co., Buffalo
Elevators
Otis Elevator Co., New York
Geared ladles
Whiting Corp., Harvey, Ill.
Grinding machines
Springfield Grinder Co., Bridgeport, Conn.
Hand cranes
Whiting Corp., Harvey, Ill.
Hand lift trucks
Barrett-Cravens Co., Chicago
Heaters
American Blower Co., Cleveland
Motors
General Electric Co., Schenectady, N. Y.
Molding machines
International Molding Machine Co., Chicago
Safety switches
Square D Co., Detroit
Sandblast equipment
Pangborn Corp., Hagerstown, Md.
Sand mixer
National Engineering Co., Chicago
Scales
Howe Scale Co., Rutland, Vt.
Tumbling mills
Whiting Corp., Harvey, Ill.

Other Departments

Yearly consumption of pine lumber by the Continental Gin Co., amounts to 5,000,000 feet. The lumber first is stored back of the machine shop from which it passes through the drying kilns into a lumber shed 80 x 150 feet and thence to the machines where it is dressed and trimmed to size.

Three simultaneous lines of production pass through the wood working plant 150 x 200 feet. Each line is directed to the point where it is to enter the general assembly. The board is not turned from the time it is placed on the kiln truck until it enters the assembly department. The shavings are blown to the boilers where steam is raised to drive a generator which furnishes power to the mill. Exhaust steam is utilized to heat the kilns and part of the buildings in the winter.

Sheet metal and paint department are housed in a building with steel frame and brick pilasters. The prepared wood flows through this building 150 feet in length. The various parts of the finished product meet at predetermined points in this department and the finished unit is tested under power before it arrives in the paint shop. A fire wall separates the paint shop from the adjoining building. Materials are stored in a battery of 13 underground tanks which may be filled either from inside or outside the building. The various ingredients are passed to the mixing room through pumps which automatically measure the amount. Sheets are painted in a series of spray booths. Large warehouse and shipping facilities have been provided to cope with a peculiar situation which obtains in the cotton gin industry. Production is spread over a 12-month period, but all the shipping is done in less than four months each year.

Anneal Iron Pistons

Question: Please inform me if it is general practice to anneal gray cast iron pistons before machining them. The pistons we have under consideration have walls ⅝ inch in thickness.

Answer: It is common practice to anneal gray cast iron pistons, before machining them. It frequently happens that pistons fracture in the machining process owing to the iron mixture used. Pistons usually are poured with a semisteel iron mixture which is essential in producing a strong close grained iron. Such a mixture has a tendency to set up internal strains in the castings which are the major cause of the casting showing fracture on cooling and machining. Annealing is used to overcome the tendency to fracture by eliminating internal strains. We suggest that you be governed by your losses from such a cause. If you are not troubled with fractures which are governed to a great extent by the size and design of casting, gating, pouring conditions, etc., you will not have to anneal your pistons although it is claimed by a number of well advised foundrymen that the piston castings are more serviceable after being annealed.

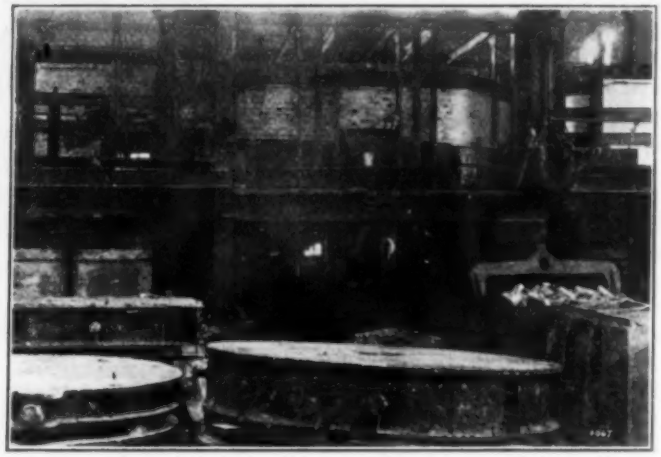
Waterbury Castings Elects

The Waterbury Castings Co., Waterbury, Conn., has elected new officers as follows: A. A. Shumann, president; Edward Dithbridge, treasurer; John Oliphant, secretary and general manager, and Frank E. Shumann, vice president.

William J. Miskella has opened an office at 1164 West Twenty-second street, Chicago, and will specialize as a consulting engineer on lacquer, japan and enamel finishing problems.

Reviews Factors Affecting Costs of Steel Castings

By W. J. Corbett



Careful Consideration Must Be Given To the Type of Melting Unit Used

STEEL castings are divided into two general classes; railway castings, couplers, side-frames, bolsters, etc. for railway cars, and all other castings. The first division is specialized highly, and is of a repetitive nature. Miscellaneous castings are diversified widely both in size and design.

The number of companies producing railway specialties is relatively few compared with the number making miscellaneous steel castings; but the average size of the railroad casting shops and the average output of castings are greatly in excess of the miscellaneous foundries. Railway castings are purchased in large quantities and lend themselves to specialized production processes on a large scale. Castings are made previous to receipt of orders and placed in stock when conditions warrant. Miscellaneous castings, other than railway specialties are purchased in smaller quantities, and each of the multitude of designs presents a separate problem in the manufacture of a satisfactory product. Because the demand for such castings must exist before production can be commenced, it is not possible for the foundries to standardize their operations and use special equipment to the same degree as the other class of foundries.

Two main classes of foundries produce miscellaneous steel castings; one, making castings of large and medium sizes with metal sections varying in thickness from ½-inch up; the other, making small castings with thinner sections. It generally is conceded that a distinction should be drawn between these two classes of foundries, each of which is qualified better than the other to make satisfactory castings falling within its field.

Manufacture of large castings involves the use of facilities differing from those used in making small castings. The floor space must be considerably greater, and there must be an adequate system of overhead crane transportation to move the molds, metal and castings. Large ovens for drying the molds also must be provided. Furnaces for melting steel and for heat-treating the castings must be considerably larger than are necessary for small castings. In addition, a large investment is essential in massive flask equipment for molding the various sizes and shapes of the numerous patterns from which castings are made.

It should not be assumed from the foregoing that the manufacture of large castings requires more skill than does the production of small castings. Both branches demand the display of much ingenuity. The production of small steel castings probably requires greater care than the manufacture of large ones, because the smaller the article the greater the precision necessary to furnish a satisfactory product. Minor imperfections, which in a large object are not distinguishable or harmful, are magnified many times in a small object, and render it objectionable.

CLEANING THE CASTINGS IS AN ITEM OF IMPORTANCE

Three types of melting furnaces are used in steel foundries; open-hearth, electric and converter. The open-hearth furnace is used in steel foundries making miscellaneous castings of large and medium size and in steel foundries designed solely for making railway specialties. The basic-lined open-hearth furnace is used practically exclusively in the latter, while the acid-lined, open-hearth furnace is used in almost every foundry making miscellaneous castings. The capacities of these furnaces vary from 5 to 40 tons. Steel may be made at a lower cost in open-hearth furnaces than in converters or electric furnaces.

The electric arc furnace and the converter generally are restricted to the manufacture of small castings. This is their logical field, due to the ability to melt hot metal in smaller quantities than is practicable with the open-hearth furnace. Small castings having sections as thin as 3/16-inch require exceedingly fluid steel to pour them. Although hot steel may be made in the open-hearth, usually it is impractical to attain the temperature possible in the other types of melting units on account of the rapid deterioration of the walls and roof. Furthermore, the 2 or 3 ton heats from the electric furnace and converter are smaller than those made in the open-hearth furnace and may be poured more quickly into the molds, thereby minimizing the loss in temperature and fluidity of metal held in the ladle.

Converters and most of the electric arc furnaces used in steel foundries are lined with acid refractory material.

Electric Furnaces

The electric furnace to a great extent is displacing the converter in the steel casting industry, as may be noted by reference to the accompanying table, based on figures compiled annually by the American Iron and Steel institute. This is due to two reasons: First, it is possible to make better steel regularly in the electric furnace. Second, the steel normally may be made in many localities at a lower cost in the electric furnace than in the converter. The initial cost of an electric furnace installation is many times that of a converter and cupola. The melting loss in the converter generally is from 15 to 20 per cent of the scrap metal and pig iron used, whereas this loss is only about 5 per cent of the metal charged into the electric furnace. Of course, the local cost of electric power exerts an important influence on the actual difference in the cost of making steel for castings by the two processes.

There is a certain point in the monthly tonnage output curve where the cost of operating any electric furnace mounts rapidly and becomes much greater than the cost of operating any converter. This condition is due to the fixed monthly demand charge for power, which the foundry must pay whether the monthly output of steel is 100 tons or 500 tons. During the fluctuations in demand for steel castings corresponding fluctuations occur in the output of the foundry, and when this reaches a certain point in periods of depressed business, the cost of making steel in an electric furnace becomes excessive.

Foundry Practice

Steel of good quality is essential to the manufacture of steel castings but other details of foundry practice equally are essential. A poor grade of steel nullifies all the care and skill used in the other operations in the foundry and conversely, the best steel that can be made will not produce good castings unless careful consideration has been given to other important details.

The design of the casting and the pattern equipment are two of the most important factors in the production of good castings. Sometimes the design of a casting prevents making the casting in an economical manner, either because it would cause great losses in the way of defective castings, or because it would not permit rapid production. Alterations in design without affecting the utility of the castings frequently overcome these difficulties.

Many of the troubles encountered in making the castings or in machining and assembling them at customers' plants are traced directly to the use of unsuitable pattern equipment in the foundry. These could be eliminated to a great extent if consumers of castings would obtain the ideas of foundrymen previous to making the patterns and core boxes. The customer pays for the pattern equipment and its maintenance, whether it is made by the foundry or by the customer. Sometimes there are disadvantages in having the foundry make the patterns and core boxes. Even when this is the case, it is desirable for the consumer to obtain the recommendations of the foundry before having such equipment made.

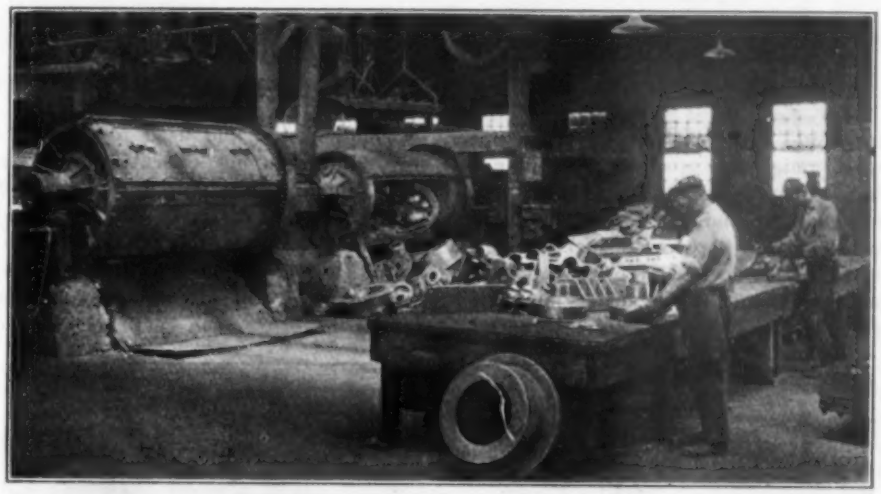
Other important details include the sand for molds and cores, the size and location of risers, gates, chills, and fillets, and the venting of molds and cores to permit free exit of gases formed as the molds are filled with steel. The molding and core sand of highly refractory material must be selected carefully and mixed with the proper amount of clay or farinaceous material to provide the bond or cohesiveness necessary.

Green and Dry Sand

When castings are made in green sand, great care must be exercised in using a molding sand that will resist the cutting action of the steel on the mold surfaces, and to prevent the gas formed from the moisture and other ingredients in the sand from forming blowholes in the castings. Green sand molds are used in most cases for castings of small and medium sizes. Larger castings having heavier sections are made in molds that have been baked or dried to eliminate the moisture. Hence, it is not so essential to have as accurate daily control of the sand mixtures used for dry sand molds as it is for green sand molds, although careful attention has to be given the former at all times. This control pertains particularly to moisture content, cohesiveness, and permeability, for which standard testing methods have been devised within the last few years by the joint committee on molding sand research.

Chills Exert Influence

The use of chills, fillets, and brackets, and the size, shape, and location of heads for risers and gates on castings exert an important influence on the making of satisfactory steel castings. Inexperience and carelessness in observance of these details cause many defects. The contraction of steel must be understood fully if such defects as cracks and shrinkage holes are to be prevented. No definite rules in regard to these may be established for application in every case, as each design of casting presents a separate problem, requiring individual attention on the part of the foundryman, who has even resorted to the X-ray in some cases to detect hidden defects, and aid him in improving his molding practice.



EARLY INSPECTION OF CASTINGS PREVENTS EXTRA COST BY CULLING THE WASTERS

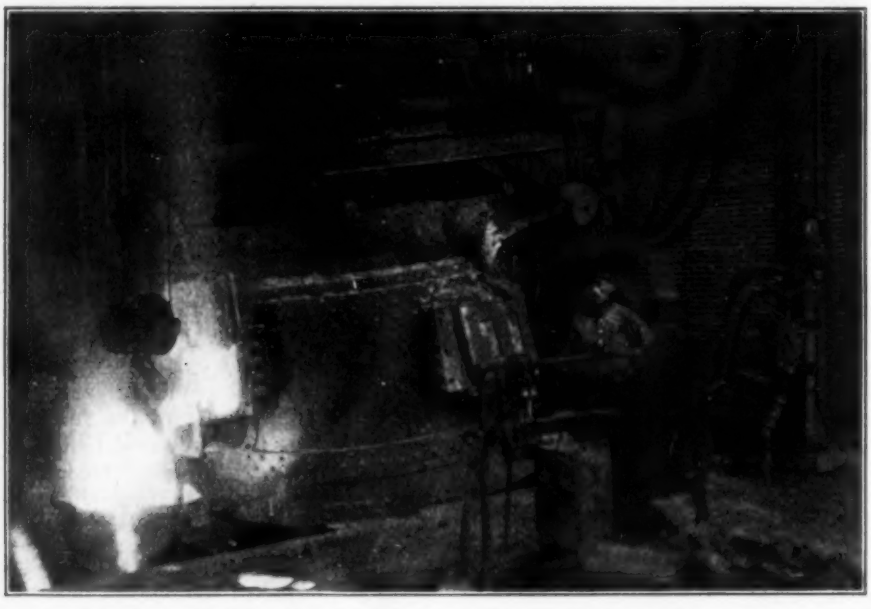
Cleaning of steel castings after they have been shaken out of the molds is another item of major importance included among the many complexities in steel foundry practice. This includes sandblasting, shipping, removing heads and gates, grinding, welding, heat-treating, and inspection. Each of these requires a considerable expenditure for specialized labor. Cost of certain types of castings is greatly in excess of that required for other

types, and depends on the designs of the castings as well as on their condition when received from the molding department.

During recent years, steel foundrymen have devoted considerable attention to the heat-treatment of their product. The term heat-treatment as now generally used includes annealing, normalizing, and other processes of heating and cooling used to develop certain physical properties in the metal. Not so long ago this operation was performed in a rather haphazard fashion in many foundries without proper regard for temperature control and time necessary to obtain the desired grain refinement of the metal. Now, all progressive steel foundries aim to develop the best combination of strength and ductility in their castings by careful regulation of the heat-treating operation. Knowing that heat-treatment greatly improves the quality of their product, they discourage the shipment of steel castings that have not been subjected to heat-treatment.

HEAT TREATING PROBLEMS HAVE RECEIVED MORE ATTENTION IN RECENT YEARS

Cost summaries prepared monthly or semimonthly and used for controlling manufacturing operations in a steel foundry, are stated in terms of costs per ton of good castings, and usually are misleading to those contemplating the manufacture of steel castings for their own use or for sale to others. Such costs are simple arithmetical averages that give no consideration to the costs of individual castings. They represent the total average costs of making thousands of castings having different designs. Fourteen cents per pound may be the average cost of making a large number of castings of different designs, some of which may range in cost from 8 to 40 cents per pound.



CONSIDERABLE INFORMATION ON MELTING PRACTICE MUST BE HAD TO OBTAIN GOOD RESULTS WHEN MELTING METALS

Cost of steel, cost of labor, and indirect or overhead expense are the three main elements in the cost of making steel castings. These are not of equal significance; consequently, a fluctuation in the price status of one element produces an effect on the total production cost only commensurate with its relative importance. The cost of labor is the most important element entering into the total cost of making miscellaneous steel castings, and is much greater than it is in many other manufacturing industries.

Cost of the metal may vary from 10 per cent to 45 per cent of the total average cost of operating a steel foundry depending on the designs of the castings. Hence, it is obvious that the weight of a casting is not the governing factor in its total cost per pound. Even in the case of castings having the same weight but having different designs, the cost of steel alone may be different for each, due to the differences in the total amount of steel melted and poured into them. The yield of good castings in percentage of the metal melted may vary from 30 per cent to 80 per cent. Some castings require a much larger amount of steel than others in the form of heads or risers to feed them while in the liquid state.

The cost of labor and the indirect expense or overhead are more important factors than the cost of the steel in making steel castings and these elements of cost are not the same for all castings. They vary with the designs of the castings as well as with their weights.

Difference In Cost

A casting whose weight is 100 pounds may cost two or three times as much to make as another casting whose weight is the same, due to the difference in their designs which necessitate the expenditure of different amounts of labor and indirect expense in making them.

A significant item of expense is that of defective castings, which includes those scrapped in the foundry and those found defective at the consumers' plants. The amount of expense attributed to this item is variable with the nature of the castings, although the total average amount of castings scrapped in the foundry may be from 5 to 15 per cent of all the castings produced.

A general idea of the cost of making steel castings might be gained if a steel foundry is considered as a concern manufacturing different kinds

of articles, each of which has a separate and distinct cost of production. Considered in this light, there would be no occasion for the common question "What is the price of steel castings?" The price of this product necessarily is variable and depends on design. Glassware, rubber goods, furniture, etc. cannot be sold at a flat price per pound of glass, rubber, and wood, because each article has its individual cost of manufacture, even though made of the same material. Similarly, each article made of cast steel in the foundry has its cost of production, and the price for which it is sold must be greater than its cost if a loss is to be prevented.

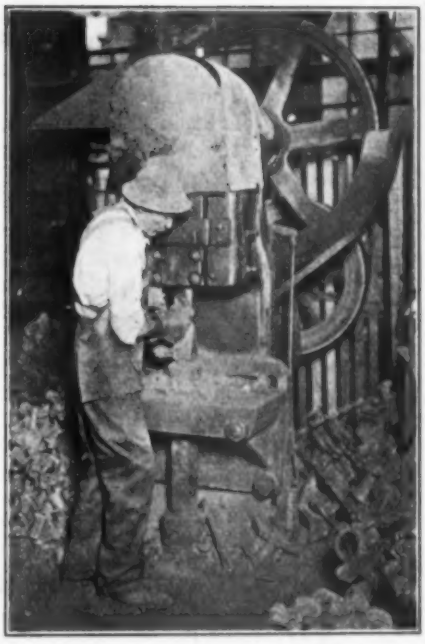
Some producers and consumers of cast steel products consider them in terms of tonnage in the same way as steel ingots, rails, etc.; that is a group of steel castings of miscellaneous designs is looked upon as a certain number of tons of steel. The fallacy of this is apparent when we stop to analyze the making of steel castings, and find that they are manufactured articles requiring the expenditure of a large amount of labor, and that the cost of the steel in them is generally small compared with the cost of the labor performed on them. If the making of steel castings required little else than making steel in a furnace of some kind, it would be correct to consider them in terms of tonnage. Since the labor expended in making them is usually the main item of cost, it is proper to think of steel castings as being products of labor instead of tons poured.

Due to the progress made in the manufacture of steel castings, much machine work on built-up parts to make them suitable for assembly may be reduced or eliminated by using steel castings that are in many cases, of complex designs. Parts redesigned for cast steel frequently can be made lighter in weight without sacrificing strength, due to the ability to make cored recesses or pockets of various shapes in the castings.

The modern engineer should make his selection of forged steel, cast steel, malleable iron, or gray iron for any part to be designed in the light of some general information regarding the progress made and the present state of the art in the manufacture of these materials. Each has its useful field of application. It is not sound on metallurgical or engineering grounds to advocate the use of one of these kinds of materials for another if the selection does not mean economy to the user after extended service. All factors, including appearance, weight, machining cost, strength, ductility, and expense of maintenance and replacement, should be considered carefully. It is not always easy to form hastily a sound conclusion regarding some of these elements of final cost. In the case of forgings, the expense attached to the manufacture of, and investment in dies must be taken into consideration quite as fully as the expense of machining a forged part of simple or intricate design.

Frank consultation and hearty cooperation between engineers and steel founders regarding all of these conditions should aid in the selection of cast steel only where it can be economically used, because the progressive manufacturer of steel castings is sufficiently far-sighted to apply his technical and merchandising efforts only in those fields where the use of cast steel is an economy.

An interesting development in the steel casting industry in recent years is the formation of the Electric Steel Founders' Research group, which consists of five separate companies making small steel castings. Each of those companies is distinctly separate from the others so far as ownership is concerned. They organized for cooperation in their industrial efforts,



THE TYPE OF CASTING GOVERNS THE METHOD OF REMOVING GATES AND RISERS

and have pooled their talents to improve the quality of their product, and to eliminate unnecessary expenditure.

Formation of this group of companies to conduct co-operative research work was radically different from anything that had ever been attempted before in the industry. When the Electric Steel Founders' Research group was formed in 1920, each member company unreservedly pledged its organization to co-operative research, freely offered to all the members the results of independent investigations, and agreed that there should be no hesitation in exchanging data. Obviously, these basic requirements implied confidence, unselfishness, altruism, and broad vision on the part of the executives of the companies.

Research investigations of the group are conducted at the different plants in accordance with mutual arrangements concerning the specific studies to be made at these plants. A central laboratory is not maintained, as it is found more expedient to carry on the researches at the plants where practical conditions obtain.

The direct results of the co-operative efforts of this research group, as well as those to be obtained by all well-planned research work in any company or industry, may be summarized as follows: 1. Improvement of present products and processes, and development of new products and processes. 2. Development of new uses for known products. 3. Standardization of quality of products, manufacturing operations and methods of analysis and control. 4. Elimination of

Annual Production of Steel Castings

In Percentage of Total Production

Year	Basic	Acid	Total	Electric furnace	Converter	Crucible
1908	44.8	45.2	90.0	0.00	5.94	2.39
1909	46.7	44.9	91.6	0.05	5.16	2.28
1910	46.0	45.7	91.7	0.14	6.20	1.56
1911	41.2	47.0	88.2	0.29	8.81	2.17
1912	45.8	44.3	90.1	0.43	7.11	2.12
1913	45.1	44.2	89.3	0.90	7.89	1.72
1914	48.3	38.9	87.2	1.23	9.50	1.61
1915	38.4	46.4	84.8	2.66	10.66	1.70
1916	44.2	41.6	85.8	3.12	10.40	0.68
1917	38.8	45.5	84.3	4.50	11.04	0.27
1918	35.9	44.9	80.8	7.67	11.40	0.09
1919	32.2	46.0	78.2	11.43	10.11	0.10
1920	35.6	43.1	78.7	12.41	8.38	0.14
1921	39.0	38.6	77.6	15.22	6.94	0.13
1922	41.1	39.3	80.4	14.97	4.61	0.11
1923	39.2	39.9	79.1	16.85	4.63	0.13

waste and therefore, reduction of costs.

The educative effect of successful co-operation upon the participants in developing careful management, a better knowledge of business principles, and a better product, is one of the chief advantages of the co-operative system. The success of the co-operative effort has two points of major interest to industry in general. First, it affords a specific example of the benefits gained from the exchange of practical information among competitors. It shows how the development of an industry or of a certain side of an industry will benefit each individual firm. Second, it shows how an important product is being improved, both as to quality and as to economical methods of production.

The steel casting industry, like many others, has a producing capacity considerably in excess of the demand for its product as may be noted by the following figures.

Year	Miscellaneous castings	Railway specialty castings
1915	73.9	66.3
1916	92.7	122.8
1917	96.7	67.7
1918	100.3	106.0
1919	46.3	25.4
1920	67.6	69.2
1921	24.6	25.0
1922	54.9	86.9
1923	72.8	77.0
1924	55.8	75.3

The figures in this table were compiled and distributed by the United States department of commerce which issues a bulletin showing the orders for steel castings booked each month. The significant feature of the data in the table is that in only one year in the last decade were the orders for miscellaneous steel castings equal in amount to the capacity of the foundries making this class of work. This was during the war in 1918, when there was an excessive demand for all kinds of manufactured products. Since the period of war-time inflation, the demand for steel castings has fallen far short of the steel foundry capacity in the United States. Even during the period of brisk business in 1923, it was only about 73 per cent of the capacity of that branch of the industry making miscellaneous castings. The statistics clearly indicate that the possibilities for the profitable employment of additional fixed capital to be invested in new foundries are problematic and hazardous as long as the producing capacity of the industry is so much in excess of the demand for its product.

Manufacture of steel castings requires a high degree of skill, and involves many phases of engineering. A steel foundry, like any other business, is successful only when it is able to meet all its obligations as they mature, and to pay a reasonable return on capital invested, with something more to provide for growth, replacements, improvements, and business depressions. To accomplish these things, an experienced and capable personnel is necessary, and the product must be sold with a knowledge of its manufacturing cost.

Some foundries have started in business with the illusion that an electric furnace alone would be the means for making high-grade steel castings at a profit. To make good electric furnace steel requires more than a furnace, a pile of cheap scrap, and a man to pull switches. Carefully selected steel scrap must be obtained, and the steel making operations must be controlled by an experienced metallurgist if satisfactory results are to be obtained. Even when the owners of electric furnaces have spent considerable time in learning how to make good steel, they have only solved one of the problems in making satisfactory steel castings.

This Should Help You Name One More

ANOTHER of the mysterious 32 *whose portraits are shown in the contest picture on page* 564 *of the July* 15 *issue of* THE FOUNDRY *has been located and identified. We give a recent portrait of this gentleman herewith. This is H. R. Donald, president and treasurer of the Donald Sales & Mfg. Co., Milwaukee. Mr. Donald will be remembered as one of the hosts at the Milwaukee convention of the American Foundrymen's association, held in* 1924. *At the time the contest picture was taken he was associated with the Robeson Process Co., New York. He and George N. Moore, who also is in the Toronto picture were active participants in the pleasant affairs of the* 1908 *convention. You will find Mr. Donald in the contest picture to the left of the post bearing the figures* 28, *but further than this it would be unfair to state.*

Make Ammonia Fittings

Question: What should be the average chemical analysis for castings to be used in ammonia compressors and ammonia fittings. We are interested in knowing the percentages of graphite and combined carbon in air furnace iron in comparison to cupola furnace iron.

Answer: A suitable air furnace iron for ammonia compressor and ammonia fittings will depend upon the size of the castings. The average chemical analysis for such work will run as follows. Silicon 1.75 per cent, sulphur 0.050 per cent, phosphorus 0.40 per cent, manganese 0.70 per cent, combined carbon 0.65 per cent, graphite 2.40 per cent. For light castings the silicon should run about 2.00 per cent and for the heavy castings the silicon should not exceed 1.25 per cent.

The great difference between air furnace iron and cupola furnace iron is that the total carbon will be found to be much lower in the air furnace iron which necessitates running a higher percentage of silicon in the air furnace mixture.

Discusses Safety

"Maintaining Interest in Safety" is the subject of a pamphlet recently issued by the National Safety council in which some of the following subjects are discussed: Starting a safety campaign, why it is necessary to maintain interest, program of activities, maintaining the interest of the management, superintendent, foremen and workers, selling new employes, bulletin boards, mass meetings, outings, playlets, distribution of printed matter, suggestion systems, schools, safety committees, board of inquiry, special contests, rule books, questions and answers, sharing ideas, the plant magazine, a safety quiz for superintendents, etc. Included also is a list of the titles of the various motion picture films that are being distributed by the institution.

Makes Low Cost Iron Castings *from Iron Borings*

By H. C. BeMent

MENTION iron borings to the average foundryman and he does not want to listen to your story. He has tried melting them in the cupola as borings, and has found they produce a lot of work, a heavy melting loss and plenty of grief. Mention iron borings to a large manufacturer of industrial equipment, using iron castings and he thinks only of the best way to get rid of them and to get the best price. In fact, he will tell you in some cases it costs more to haul and load them than the price received. In many places borings are used to make walks, roads and fills.

Equipment and machinery has been designed to put iron borings in a condition for remelting in the foundry, such as briquetting machines but they are not used universally.

Recently a manufacturer of railroad and locomotive equipment in the Central South installed a 1½ ton acid electric furnace built by William Swindell & Brothers, Pittsburgh. While building up the casting business, this furnace was running only a small part of the time. To fill up this operating time it was decided to melt iron borings, which the machine shops of the company produced at the rate of 140 tons per month. The average analysis of these borings ran 3.05 to 3.15 per cent carbon and 1.25 to 1.35 per cent silicon. It was planned to melt this iron and pour directly into castings.

Four heats were melted and poured and the castings which, when taken into the machine shop for finishing, were found to be relatively too hard. The analysis of these castings was 2.70 per cent total carbon and 1.50 per cent silicon. It was then decided to increase the silicon to better the machineability of the castings, and the next four heats were poured with a silicon running from 2.00 to 2.25 per cent.

These castings still were to hard to machine owing to the low percentage of graphitic carbon, although the castings were sound, showed greater shrinkage at the cope and, in fracture, showed a even-grained structure. The drop in carbon on this iron of 30 to 40 points and the pickup of 15 to 20 points of silicon undoubtedly was caused by the free graphite in the fine borings reducing silica from the sand and slag in the charge to silicon. It should be noted that the borings were outside cuts from castings which had sand burned in.

It next was decided to add carbon to the heat and to do so after the metal was melted. A fine grade of petroleum coke was procured and ground up fine like coke breeze. When the temperature of the metal became high, 35 pounds of this coke was added and boiled into the metal by using green poles or saplings 12 to 16 feet long 3 to 4 inches in diameter at the large end. Two poles were used to a heat which required about 10 minutes.

The analysis of four heats made in this way showed the carbon had jumped to 3.00 and 3.19 per cent and also the silicon had increased to as high as 2.10 per cent, showing a good carbon pickup but also a big silicon reduction. The slag in the bath plus the excess coke had really turned the top of the heat into a miniature ferro-silicon furnace. All castings made from these heats were too soft although they showed a fairly close grain structure and an extreme amount of shrink due to the higher pouring temperature, and had a transverse strength of 4100 pounds.

Due to the extreme amount of silica reduction while adding carbon, other methods were tried during the melting process. It was found that the secondary furnace voltages in this process were important in this particular type of furnace, the furnace used having a wide and special range of secondary furnace voltages.

After the whole method of operation had been reduced to a standard practice, it was decided to use this electric gray iron for making locomotive piston rings. The high quality of iron required for such piston rings calls for perfect uniformity in the iron with a maximum amount of transverse strength and resilience. Not only are these physical properties required but machineability of the rings determines the cost of machining and the rate of output in the machine shop. This is an extremely important factor as the rings are manufactured on a production basis, using modern machines with labor on a piece work basis. It will be shown later that not only was the cost of producing molten gray iron cheaper but the percentage of rejections was cut down by a remarkable degree.

The final method of procedure was as follows: To 3000 pounds of iron borings, 20 pounds of extermely fine coke was added and well mixed, then charged into the furnace, power turned on and when iron was melted, chill

Table I

Power Required for Tests

Heat No.	Weight	KWH per ton	Hr.	Min.	C.	Analysis Si.	Mn.	Silicon Added	Transverse	Demand
46	3000	680	1	25	2.89	1.92	.63	22	4350	720
47	3000	620	1	25	2.91	1.87	.66	20	4300	715
48	3000	551	1	5	2.87	1.93	.55	22	4250	650
49	3000	607	1	20	2.87	2.03	.64	24	4350	700
50	3000	648	1	30	2.89	2.01	.65	25	4500	750
51	3000	647	1	30	2.92	1.88	.58	20	4500	720
52	3000	547	1	10	2.83	1.80	...	20	4550	728
53	3000	527	1	20	2.90	1.88	...	20	4150	725
54	3000	630	1	40	2.83	1.88	.61	20	4400	700
55	3000	560	1	15	3.05	1.92	...	20	4350	685
56	3000	640	1	30	2.89	1.88	...	20	4250	712
57	3000	540	1	10	2.92	1.92	.70	20	4250	724

tests and fracture tests taken to give an estimated idea of silicon content.

All these tests showed approximately 1.50 per cent silicon, .40 per cent of silicon then being added in the form of ferrosilicon. The iron was brought to the proper pouring temperature and poured. A list of heats melted this way, showing time, power consumption, analysis and power demand load is shown in Table I.

The power consumption was high, higher than on steel heats, due to the fineness of the borings and the great number of small dead air spaces that heat had to be driven into.

The most important discoveries in this electric furnace iron was that the silicon content must be higher by 50 points than cupola iron for the same purpose, while the carbon is slightly lower. The pouring temperature must be 100 degrees Fahr. higher than metal from the cupola of like analysis and for same castings. Test bars show greater transverse strength, while the castings have greater shinkage and closer grained structure.

Although 50 points higher silicon is necessary on this grade of iron, it is not true that all irons melted in the electric furnace must be higher. Borings, which came from castings from some of the above heats when remelted ran 1.90 per cent silicon on the charge, and melted down 2.00 to 2.10 per cent. The resulting castings were equally as strong on transverse and showed a fine grain structure and good machining properties.

Borings of any analysis may be handled equally as well to make castings similar to those from which they came as well as of a higher silicon and carbon content. It would not be advisable to try and use borings of a high silicon content to make castings of a low silicon content in an acid lined furnace, since complications in operation would arise and it would be necessary to remove the silicon, which could be done only under the guidance of a skilled furnace operator. The pouring temperature should be higher by at least 100 degrees Fahr. because of the more complete deoxidizing condition of the electric furnace, giving a more thorough deoxidized iron which has a higher point of solidification and has a tendency to chill or solidify quickly. Molding sand or facing should be slightly more refractory than for ordinary gray iron sand and may contain a larger quantity of sea coal to give a smooth casting and one that will shake out clean.

A slight allowance on patterns should be made and heavier risers should be used to care for greater shrinkage on this kind of gray iron, poured at high temperatures. The percentage of lost castings caused by slag and sand being imprisoned may be cut to a minimum due to the greater fluidity of this high temperature iron, which gives the sand, slag and etc., a greater opportunity to come from the casting into the riser.

After all the borings have been charged, take a rabble and level off the top, then dig a hole about 8 inches deep under each electrode, which allows the electrodes to start melting closer to the bottom, and cuts the melting time down considerably.

A comparison of costs of melting iron borings in the electric furnace against the melting of pig and scrap iron in the cupola showed a wide variation. Cupola iron in that particular foundry figured over a period of several years, showed an average cost of $34.50 per ton, for metal at the spout. The cost per ton of electric furnace iron figured on an average of 100 heats covering one month's operations, melting at night and using the night shake-out gang for pouring is shown in Table II.

The cost of cupola iron was $34.50 and the cost of electric furnace iron was $20.66 shows a saving of $13.84 by using the electric furnace. Figuring this on a scrap boring production of 140 tons per month, realizes a saving over the same tonnage of cupola iron of $1937.60 per month or $23,251.20 per year and at the same time giving a product superior in quality and strength with a less casting loss due to rejections.

These figures more than show that the electric furnace properly handled not only will win its place in the iron foundry but may be a source of continued revenue for those who already have them and need something to fill up their production.

Table II

Cost Per Ton of Castings

Material	Cost	Per Ton
Iron Borings	$ 6.00 per ton	$6.00
No. 20 Coke (Petroleum)	10.00 per ton	.10
No. 25 Ferro-Silicon	70.00 per ton	.88
No. 7 Graphite Electrodes	18c per pound	1.26
No. 3 Melting Loss		.18
619 K.W.H. per ton	15c per K.W.H.	9.29
Refractories	38c per ton	.38
Melter	1.30 per hour	1.19
Helper	.60 per hour	.40
Labor to charge	2 men 15 min. @ 40c per hour	.20
Depreciation on Investment		.78
Total cost per ton		$20.66

Gives Time Allowance in Dumping Molds

Question: Would you advise dumping small molds that weigh approximately from 5 to 10 pounds within a period of 10 minutes after pouring, or would you advise waiting approximately an hour or an hour and a half. What effect does it have on the castings when they are dumped immediately after pouring?

Answer: The time allowance before dumping castings after pouring will depend upon the size and the thickness of the casting. Under normal conditions it is safe to dump a mold after the metal is set. You will be perfectly safe in dumping small molds well within the 10 minutes after pouring.

In a general way to dump castings *immediately* after pouring is to run the risk of surface chills, warpage and cracking or fracture of the castings, according to their thickness and designs. Allowing the casting to remain in the mold from one to two hours before dumping, has a tendency to soften the skin of the casting by a mild form of annealing.

Joins Metal Company

Guy F. Creveling, for 13 years associate editor of *Daily Metal Trade* Cleveland, has resigned to become secretary of the Hirshler Metals Co., Inc., New York. Mr. Creveling had been in charge of the New York nonferrous metals news bureau for the past eight years. He is succeeded by William J. Nolle formerly nonferrous editor at Cleveland. William M. Rooney succeeds the latter as nonferrous editor at Cleveland. The change became effective July 23.

Appoint Representative

H. D. Conkey & Co., Mendota, Ill. have appointed as Chicago district representatives, Page & Ludwick, 1417 Lytton building, Chicago. The Conkey company manufactures cranes, hoists, trucks and industrial cars.

STANDARD FOUNDRY GRINDING WHEELS

In the interest of standardization and to enable the user to vizualize at once the range of types of foundry grinding wheels, there are shown on Data Sheet No. 586, cross sections of the five standard types which are used in foundry grinding operations. These have been approved by Grinding Wheel Manufacturers Association of the United States and Canada.

The types of wheels which are applicable to foundry service are numbered from 1 to 4 and 6, and each dimension designated by letter. The key to the dimension letters is shown accompanying with the illustrations of the five standard types on Data Sheet No. 586.

This classification of grinding wheels greatly simplifies the stocking of wheels wherever a quantity is kept on hand. It also enables the user accurately to order a grinding wheel by giving the type number and the complete dimensions necessary to construct such a wheel, as designated by the cross section of that type.

Key To Letter Dimensions

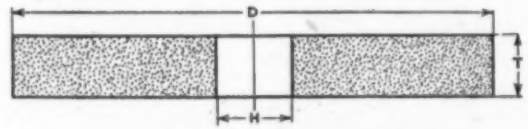
A	Flat spot of beveled wall
C	Height of dovetail
D	Diameter overall
E	Center or back thickness
H	Arbor hole
J	Diameter of flat or small diameter
K	Diameter of flat inside
M	Large diameter of bevel
N	Small diameter of bevel
P	Diameter of recess
R	Radius
T	Thickness overall
U	Width of face
V	Angle of bevel
W	Thickness of wall

(Continued on Data Sheet No. 586)

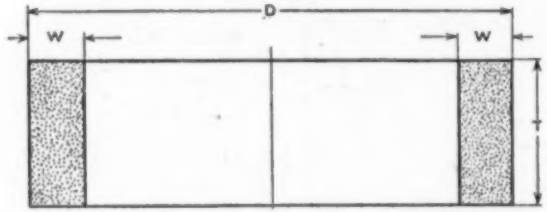
STANDARD FOUNDRY GRINDING WHEELS

(Continued From Data Sheet No. 585)

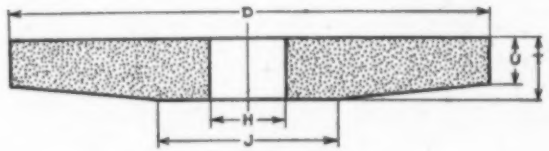
Type No. 1 — **Straight**



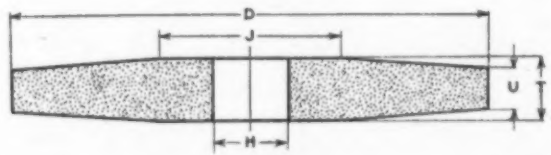
Type No. 2 — **Cylinder**



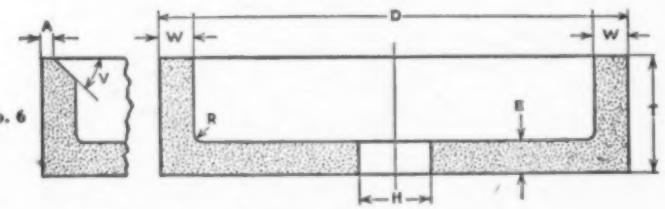
Type No. 3 — **Tapered One Side**



Type No. 4 — **Tapered Two Sides**



Type No. 6 — **Straight Cup**



Wheels of this type can be furnished with beveled face

(Continued on Data Sheet No. 587)

Note—This sheet may be cut into two sections, 5 x 7 inches, and may be readily bound in note book form.

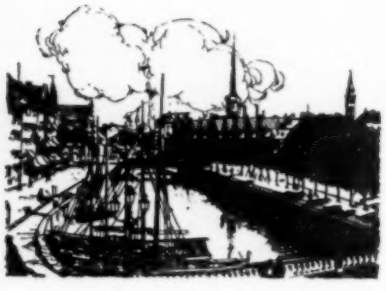
THE FOUNDRY DATA SHEET, AUG. 15, 1925

Payment will be made for all contributions on foundry and pattern shop practice suitable for publication

Around the World with The Foundry

Little Journeys to the homes of our readers

Denmark!



WITH a bank of long flashing sweeps on either side, rising and falling in rhythm and unison, the sharp prowed galleys manned by scores of hardy marauders periodically for centuries set out from the fiords of Denmark and levied tribute on the inhabitants of the countries bordering on the North Sea and the German Ocean. Rapine and pillage followed their foot steps. They acknowledged allegiance neither to God or man. They took no thought for the morrow or the manner of their taking off but looked forward with pleasure to a future existence in the halls of Valhala where in company with Thor and Odin, waited upon the beautiful Valkyrie they could spend an eternity quaffing the nut brown mead from foaming tankards.

These days have gone by and the last of the fierce old sea rovers long since has been gathered to his fathers. The Denmark of today is a law abiding peaceful nation with the habits and customs common to the other civilized nations of the world. With neither mineral or fuel resources it is essentially an agricultural with an immense export trade in farm products. Its fisheries also are a source of wealth.

Castings are required both in fishing and agricultural pursuits and the demand is met by foundries in Copenhagen and other cities. In ten out of the 33 plants listed THE FOUNDRY is welcomed twice a month and keeps the executive officers in charge posted on all that is worth while in foundry practice.

"Wherever metals are cast you'll find THE FOUNDRY"

Machines Supplant Hand Molding Methods

By Pat Dwyer

Fig. 1.—Mold and Core Are Made in Green Sand

LAYOUT of plant and equipment at the works of the Richardson & Boynton Co., Dover, N. J., together with a description of the manner in which materials are handled and also a reference to a system by which the patterns have been renumbered and a perpetual inventory of castings maintained were presented in former issues of THE FOUNDRY. Some of the molding methods shown in the accompanying illustrations indicate in an interesting manner the extent to which modern mechanical equipment is usurping the place once held by the carefully trained and highly skilled molder. An interesting type of casting still made in the boiler department of the foundry by a time tried method is shown in Fig. 1. The mold, flask and core for the casting are shown in Fig. 4, and represent a complete day's work for a molder.

The degree of speed and skill required to make this mold entirely by hand may be inferred from the statement that men working on this job make from $12 to $15 a day. Plans now are under way to simplify the process by the adoption of a partial dry sand core, but in all probability some time will elapse before the present method finally is abandoned.

This is particularly true of the larger sizes represented by the casting shown in Fig. 1. The demand for this size is comparatively limited and up to the present, production easily has kept pace with demand. The method illustrated has been practiced for many years and in the hands of competent molders has produced and still produces satisfactory castings. The two main reasons which prompted a desire for a change are that the method is comparatively slow and competent molders are not as numerous as they were.

The casting is a one-piece, furnace radiator 5 feet in diameter and is entirely enclosed with the exception of an 8-inch opening in the center of one side and seven 2-inch openings on top for the accomodation of the anchor bolts supporting the green-sand core. The iron pattern is tapered generously and split horizontally as may be noted on the joint line shown on the casting Fig. 1. The pattern is an exact duplicate of the casting, plus the contraction allowance, and serves for both pattern and corebox. One half the mold is made in the drag and one half is made in the cope of a special hexagonal iron flask which reduces to a minimum the amount of sand required.

Making the Mold

The lower half of the pattern is placed on a board which locates it accurately in a definite position in the drag flask. This precaution is observed so that the upper part of the pattern later will fit properly in the cope with the holes for the core anchor bolts directly under corresponding openings in the bars.

Two gate cores with openings ¼-inch x 6 inches are placed in position vertically against the pattern and at two points where angles in the flask provide the most room. The drag is filled with sand, rammed and rolled over in the usual manner. A sectional arbor is adjusted inside the pattern which then is rammed full of sand up to the parting line. The upper part of the pattern is placed in position, the lifting bolts are attached and the remainder of the space inside the pattern is packed full of sand.

The degree of density to which the sand is rammed is an important factor in determining the success or failure of the casting. It must be rammed sufficiently hard to resist the pressure of the iron and soft enough to permit the ready escape of the gas and steam when the core is surrounded by molten iron. The wall of the casting is only ¼-inch thick and the casting itself must pass an inspection test in which a little excessive weight will condemn it. From the foregoing it is apparent that the job is not one to be entrusted to a beginner.

Ingenious rigging is provided for holding the core in its place after the pattern has been removed and later while the mold is filling with iron. Seven bolts attached to the core arbor project above the top of the cope. Six of these bolts are spaced equidistantly over the circular top while the seventh is designed to support that part of the core which projects like a tongue more than half way across the ring on a diametrical line.

A level bed on which to place the drag is one of the most important factors in making the mold and is

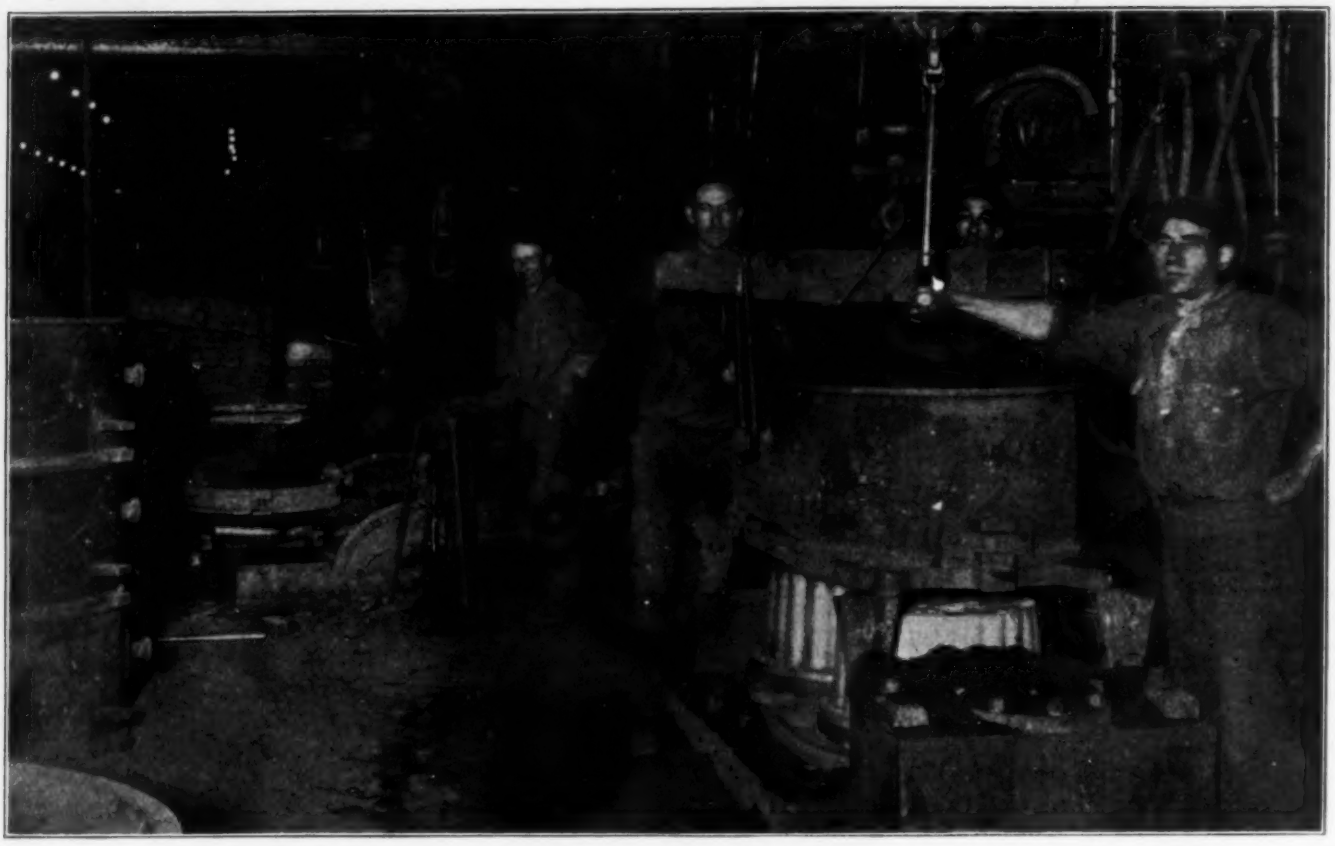


FIG. 3—FIREPOT MOLDS ARE MADE TWO IN A FLASK ON TWO SEPARATE MACHINES. THE DRAG WITH THE GREEN SAND CORE IS MADE ON A ROLLOVER JOLT MACHINE WHILE THE COPE IS MADE ON A PLAIN JOLTER EQUIPPED WITH A PATTERN STRIPPING DEVICE

secured in a relatively simple manner. The molder makes an approximately level bed on the floor and then twists the drag slowly through a short arc as it descends and in that manner brings it to rest finally, level and firm.

An effective and equally simple method has been developed for automatically leveling the pattern before the core is removed. After the cope is rammed full of sand it is lifted off and left suspended on the crane while the molder effects any necessary minor repairs and lifts the top half of the pattern away from the core. The cope then is returned to place and is located accurately by four long 1-inch diameter guide pins. These pins project a sufficient distance above the joint to prevent any possibility of a *touch* between the vertical walls of the mold and the core.

FIG. 2—LONG PINS GUIDE THE COPE INTO PLACE ACCURATELY

Cope Is Lifted

With the cope in place, the core anchor bolts are secured to prevent the core from shifting when deprived of the support of the lower half of the pattern. A wide washer resting on the top of the bar is placed around the upper end of each bolt and a flat steel wedge key is driven through a slot provided near the top of the bolt for that purpose. After all the keys are tightened the cope once more is lifted and this time the entire core and the lower half of the pattern come with it.

After it is lifted high enough to clear the mold it is taken a little to one side and lowered until the pattern almost touches the floor. Wood wedges are driven under the pattern at several points and then it is rapped to release it from the core. The cope once more is lifted, leaving the pattern resting on the floor. After any necessary minor repairs have been made to the core and mold, the cope is returned to place on the drag and clamped in place by the insertion of steel keys through suitable slots in the guide pins.

While it is true that the molds for fire pots and feed sections shown in Figs. 2, 3, 5 and 6 are not as difficult to make as the mold for the radiator section shown in Fig. 1, still, under ordinary conditions, they involve the service of skilled molders. Adoption of improved pattern and molding machine equipment has lifted these jobs out of the hazardous class at the foundry of Richardson & Boynton Co., and has enabled the company to secure satisfactory production from a gang of special young operators intensively trained on one job.

Most of the boys are Italian of the second generation. That is, their parents migrated from Italy and the boys either were born in the United States or came in as young children. With the exception of their names and complexions there is nothing to distinguish them from other young men whose immediate or remote ancestors may have arrived from north-

ern European countries. To a certain extent the section of the foundry in which these molds are made serves as a training school from which the operators who show particular aptitude may graduate onto floors where a greater degree of skill is required and where the remuneration is in proportion. They are paid a flat hourly rate when they start working on the machines and after they have become accustomed to the work their rate is increased accordingly.

Each man has certain, well-defined duties to perform in the construction of the mold and in the main these duties synchronize with those of the others and keep him fairly busy. However, on occasion he is willing and ready to go outside his regularly defined duties and assume temporarily the duties of any other member of the gang.

Molds are Jolted

Two molding machines supplied by the Hermann Pneumatic Machine Co., Pittsburgh, are employed in making the fire pot mold shown in Fig. 3. The drag with the green sand core in place is rammed on a rollover, pattern-draw, jolt machine shown to the left at the back. The cope is rammed on a jolt machine equipped with a suitable device for stripping the mold clear of the pattern before the weight is taken by the crane. Each machine is served by a light jib crane equipped with a small electric hoist made by the General Electric Co., and controlled from the floor. A traveling crane mounted on a runway above the jibs conveys the molds to the pouring floor. The same crane later is employed to pour the iron and shake out the castings.

FIG. 4—THE IRON PATTERN FOR THIS RADIATOR SECTION IS A SHELL SPLIT THROUGH THE CENTER TO SERVE FOR BOTH PATTERN AND COREBOX. THE GREEN SAND CORE IS SUSPENDED FROM THE COPE

A considerable measure of economy is effected by molding these castings two at a time in one flask. With the single exception of the time taken to shovel a double quantity of sand into the flask, it is apparent that all the other features connected with making a mold are affected as rapidly

FIG. 5—TYPICAL FLOOR OF FIREPOT MOLDS WITH TWO MOLDS TO A FLASK READY FOR POURING. THE FLASKS ARE HELD TOGETHER BY CLAMPS IN THE CENTER AND BY STEEL KEYS DRIVEN THROUGH BOLTS AT THE ENDS

FIG. 6—FURNACE FEED SECTIONS ARE MADE IN FLASKS CLOSELY CONFORMING TO THE SHAPE OF THE PATTERN, MACHINED ON THE JOINTS AND WITH THE RESPECTIVE PARTS INTERCHANGEABLE

for two molds as for one. Preparations are under way to install several additional molding units operated on the same principle.

Sand for these molds is prepared by passing it through a revolving belt type mixer made by the Royer Foundry & Machine Co., Wilkes-Barre, Pa. A similar machine is employed to prepare the sand for the feed section molds shown in Figs. 2 and 6.

These molds are made on a rollover jolt machine manufactured by the Osborn Mfg. Co., Cleveland. The drags are made first and set on the floor in regular rows. The pattern then is changed on the machine and a sufficient number of copes are made to cover the drags. The drag is rolled over and then lowered upon a leveling car where the pattern is drawn. The car and drag are pushed away from the machine to a point where they will not interfere with the process of placing another drag flask on the table. The finished drag is taken by a traveling crane to one of the neighboring floors where it is lowered on to a pair of planks. The planks are spaced about one foot apart and prevent the flask edges from touching the floor. The space between the flask and the floor serves as an ample passage for the steam and gas generated in the mold while it is filling with iron.

Special flasks conforming closely to the shape of the pattern effect an appreciable saving in the amount of sand required. Bars in the drag retain the sand without the use of a bottom plate and in that manner save a considerable amount of time that otherwise would be devoted to carrying plates and attaching them to the flasks. Long, substantial pins that are shifted from flask to flask after they have served their purpose, are used for closing the copes down on the drags. The flasks are machined on the joints and the respective parts are interchangeable.

Considerable expense was involved in developing patterns and flask equipment for making these castings, but it is claimed the results have more than justified anticipation in increased production, lowered costs and reduction of scrap. Also it is regarded as a step along the road favored by all manufacturing executives, the road which leads to simplification and standardization.

Saves Cores From Scrap Heap

ACCORDING to Oxy-acetylene Tips, *a novel scheme was used to remodel some heavy reinforced cores shown in the illustration. These cores were made for a special order of castings and later it was found desirable to extend a recess to let the hollowed section run from one side of the core to the other. It was easy to remove the sand, but since the cores were reinforced with several sections of 1½-inch pipe, the removal of these without breaking the cores was a perplexing problem.*

The oxy-acetylene blow pipe was called into service. The cores were picked up one at a time by a traveling crane, and brought to a cutting operator who, between his regular work of cutting off risers from castings, trimmed out the reinforcing sections with the blow pipe. The sand was cut a little deeper than the finished surface and the operator cut the reinforcement to a point below the surface. The altered cores were ready in a short time after finishing properly with foundry sand.

CUT BARS WITH OXY-ACETYLENE TORCH

Extending Uses of Oil Sand Cores

Englishman Shows How Dry Sand Core Gradually Is Being Superseded by Oil Cores

Probability of Producing Better Castings Is Greatly Enhanced With This Product

By F. C. Edwards

GENERAL adoption of many developments in the foundry industry often has been delayed by a great antipathy on the part of the foundrymen to deviate from the paths established years before. That comparatively limited use of oil sand cores is being made in England, is the charge made by the author of this paper, which was presented at the meeting of the Birmingham and West Midlands branch of the Institute of British Foundrymen, held in Birmingham, recently. The author is patternshop manager of W. & T. Avery, Ltd., Birmingham, England, manufacturer of scales.

GENERAL superiority of the oil sand core over the ordinary dry sand core now is established beyond the pale of argument. Everyone knows that with oil sand cores both venting and core irons are dispensed with almost entirely, and that such cores are simpler and less expensive to produce. It also is common knowledge that, without its aid, some of the best classes of foundry work for example motor cylinders, would be impossible to make. This universal realization of the advantages of oil sand cores must lead to their universal adoption. Even the ultra-conservative foundrymen will be compelled, sooner or later, to make use of this factor.

One of the primary, if not the foremost function of the Institute of British Foundrymen is the dissemination the latest tried out methods relating to the pursuit of the craft. The exploitation of the possibilities of the oil sand core furnishes a typical case in point. Its most complete utilization lies in the consideration of its ever widening possibilities, and in the broadcasting of its behavior in the various situations in which it has been successfully employed. The generic name covers the original mixture of linseed oil and sea sand with the respective proportions, by weight, of about 1 in 40, as well as those innumerable proprietary mixtures of gums and glutens which bear more or less descriptive names of their bases.

Some mixtures are better adapted for certain classes of work than others. Actual tests will best determine their fitness. Consequently it is unwise to conclude, from a trial of one mixture alone, that oil sand cores are unsuitable for any given job. That this is sometimes the case may be assumed from a remark recently made by a competent foundry manager of long experience. This gentleman happened to be in the core shop of a foundry that had obtained an order from his firm for certain high class castings. On every hand he found oil sand cores being made. Turning to the foreman in charge, he remarked: "I should not use that stuff; we require a good face on our castings!" Evidently, his experience of oil sand cores must have been somewhat limited. It may be added that subsequent enquiries elicited the fact that his own foreman coremaker, although capable with the old methods, was lacking in that spirit of enterprise and initiative. However, oil sand cores not only were used extensively for the cores, but were employed in forming certain parts of the molds, and when the castings were delivered, the skeptical foundry manager declared that he had never seen better looking castings.

Such a gratifying result was not achieved by using the plain linseed oil and sea sand mixture alone. It must be admitted this leaves a comparatively rough surface on the casting. An important point in its favor is it being able to withstand the effect of moisture without collapsing. Such cores may be built in a green sand mold in the early stages of a job without any risk of their disintegration by the humidity of the mold. Fig. 1 illustrates a type of double core, which frequently is built in a green-sand mold several days before casting. The outside core *A* is made in two parts to enable the inner core *B* to be inserted in its place. When assembled, the double core is placed with its open side against the pattern and the whole is rammed up as simply as ramming a brick!

The plain linseed-oil core is good

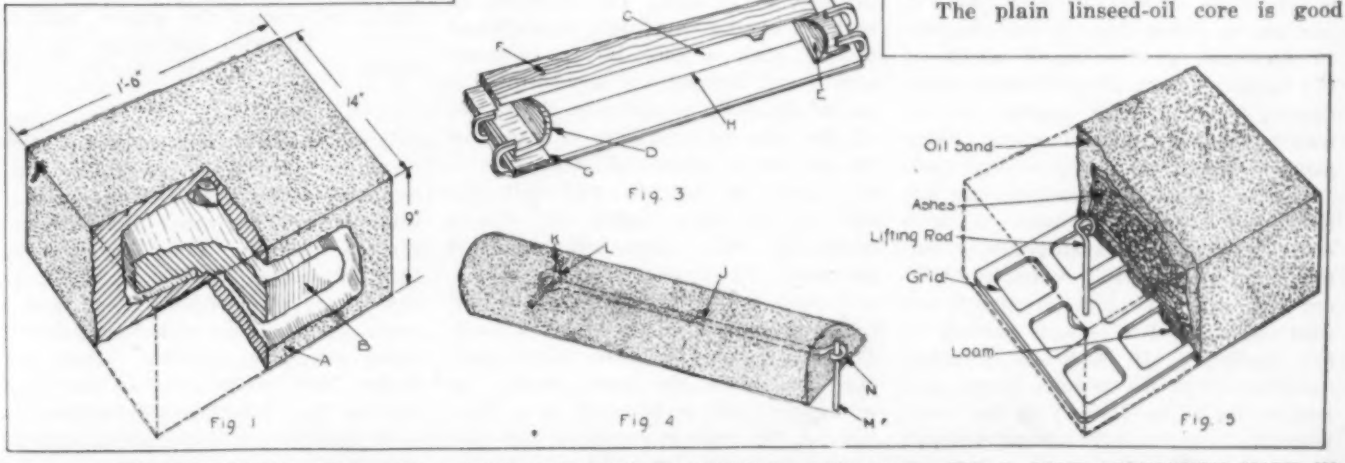


FIG. 1—A TYPE OF DOUBLE CORE. FIG. 2—DIFFICULT CORE TO MAKE IN DRY SAND. FIG. 3—CORE ORDINARILY MADE IN LOAM. FIG. 4—METHOD OF ANCHORING THE CORE. FIG. 5—ONLY SIMPLE GRIDS ARE NEEDED ON THIS JOB

for adjustment loading holes in weight castings. Here a slight roughness of the surface obviously is an advantage as it helps to retain the lead by which the casting subsequently is loaded to its exact weight. Although these cores are placed regularly in the green sand mold suspended from the cope several hours before casting, they remain unaffected by the surrounding moisture. In the smaller size weights the cores are ⅛-inch thick, ½-inch wide and 1-inch long. No vents or sprigs are used. These cores are made from a plate containing about 100 slots, each slot being a corebox. A boy makes from 20 to 30 plates of cores an hour, or from 2000 to 3000 separate cores.

Production Costs Cut

This is an improvement over the dry sand core. There is a gain in speed, and the cost of production is reduced considerably. Furthermore, the cores fall away freely from the castings, there being no need for shaking. The oil bond is consumed completely and as nothing remains to hold the sand together, the castings are left perfectly clean inside.

The disqualifying feature of the plain linseed oil and sea sand core for general work is that it easily collapses when green. This seriously militates against its use for anything beyond flat cores, where the cores are supported completely on the drying plate. Even in the latter case, thick cores may shake to pieces when transported to the oven. In such a core as that shown in Fig. 2 it would be altogether impossible to use the linseed oil mixture, on account of its depth and length.

There are certain proprietary mixtures from which any shape of core may be made, and which leave an excellent surface on the castings. It would be invidious if not entirely out of place in this paper, to mention any of these by name. In any case, it perhaps is better for the foundryman to ascertain at first hand which of the various brands give the most satisfactory results when applied to his own particular class of work. With some brands the cores, though possessing certain good qualities, are not so impervious to moisture as with other brands; consequently their employment is somewhat restricted. Others not only are moisture-proof but also impart a nice smooth surface to the castings. In addition to these qualities core oils permit beads and projections to be formed on the cores without any reinforcement, which would require sprigging with dry sand cores to prevent breaking off.

There is a wide and profitable field for the employment of oil sand cores, with the larger type of dry sand core, those for which expensive core irons ordinarily would be required. Two or three loose crossed rods, through one of which a hook may be inserted for handling the core, obviate the need for grids in the case of cores up to about 3 feet square and several inches deep. Even in the largest jobs only the simplest grids are necessary.

For example, consider a rectangular block core, as shown in Fig. 5. The oil sand method is as follows: Upon a plate large enough to carry the core, loam is spread to a thickness of about 1-inch. Over this a plain grid is laid

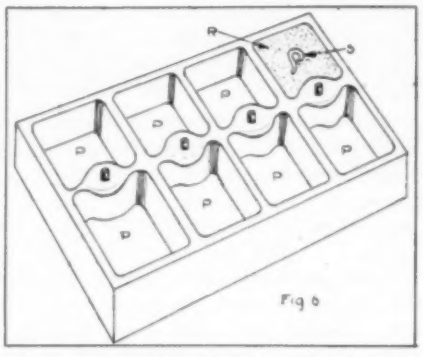


FIG. 6—THIS PATTERN MAY BE MOLDED IN SEVERAL WAYS

without prods. The loam is made up to the top surface of the grid. When dry, the grid carrying the slab of loam is turned over, and the latter is blacked well on the lower surface. This saves a crane handling operation of the heavy core later on. The loam plate is returned to its original position, that is blacked side down, and the corebox positioned over it. The bottom and the sides of the box are lined with from 3 to 4 inches of oil sand. The sides are built up with a board supported at the back by weights. The middle space is filled with ashes to within 3 inches from the top of the box. This is filled up with oil sand. One night is sufficient to dry such a core in an ordinary core oven. Beyond the accidental virtue of the body of ashes in the center of the core, no provision is made for the escape of gases. A vent wire is not used on the job, and only one side of the core opens out into a point, the other sides being enclosed by metal 1½ inches thick.

It will be seen from Fig. 5 that the core is in the nature of a shell. The shell quickly collapses in the casting, and since the grid carries no prods, the core is removed in a fraction of the time required in the case of the ordinary dry sand core.

Where small cores are inserted in large ones, or in large dried molds, they should not be placed in position until the latter are dry. If this order is reversed, the small cores are burnt by the heat required to dry the large cores or large molds.

The foregoing remarks largely refer to the superior merits of the oil sand core considered as a substitute for the dry sand core. The object of this paper is to indicate from actual cases, how the uses of the oil sand core may be extended beyond those usual with dry sand, and how some of the work that now is done by the molder with more or less difficulty, may be carried out easily, expeditiously and economically in the core shop.

Let us consider, first, how the oil sand core may be employed with advantage, both in speed and economy, in the place of certain cylindrical loam cores. Here with new work, the expense of a loam barrel is saved, as well as that of fibre or hay band. No roughing or finishing is required, which in the case of loam cores, usually necessitates two or three nights' drying, but one operation and one night's drying in an ordinary core oven usually will suffice.

Take, as an example, the case of a core, ordinarily made in loam, say 12 inches in diameter, and 7 feet long, with a reduced neck, similar to that produced by the projection on the strickle board *F* in Fig. 3. The sketch shows plate *C* and guides *D* and *E* and strickle *F* in position for strickling up a half-core in oil sand. The method of operating is as follows: A center line *H* is marked along the iron plate *C* and another line *G* is laid down at right angles to *H*. Guide *D* is clamped down securely at the end of the plate with its inside edge on the line *G*. Guide *E* is positioned at the opposite end of the plate by the board *F* and a set-square. This guide block also is clamped in position. The oil sand is filled in between the guides, and the core is strickled to shape by the board *F*.

Rotate Board

It will be seen that the board is rotated, not the core. The guide blocks are removed, and the core is stoved on the plate. The other half core is formed similarly. When dry, the two half cores are jointed and pasted together or, if considered necessary, a more secure means of holding the half cores may be adopted. Rods and hooks could be imbedded in each half, and the two firmly bolted together.

If several identical cores are required, the guide blocks may be cast on a specially made plate. In this

case the cores would be turned out into a frame. This simply would involve a rough wooden frame being made a little deeper than the core, and large enough to surround it. The frame is placed over the finished green core and is filled with black sand. The core is embedded out and stoved.

Securing the Core

The question may arise, as to how such a core may be secured in case it is to be anchored in the drag. The method of doing this is shown in Fig. 4. Here a rod *J*, carrying a crossbar *K* through the buried end loop *L* is built in the core. When the two half cores are pasted or bolted together, another rod *M* may be passed through the loops *N* in each half core respectively, as through holes in the end of an ordinary core barrel, and thus secured to the box part.

It is not too much to say that there is less risk of an oil sand core getting away when secured in this manner than is entailed in the case of a loam core on a barrel, for in the latter case, although the core barrel may be held firmly to the bars of the box part, the core itself might become loosened from the barrel by the hay band becoming overheated. The core then would be in imminent danger of being forced upward by the hydrostatic upward pressure of the metal. With the oil sand core there is no hay band or hollow barrel to tempt the molten metal to play any mischievous pranks as the job is being poured.

The example of oil sand replacing loam cores is subject to many variations in which the work of the patternmaker and coremaker may be simplified greatly and the cost of production materially reduced.

The most striking successes of the oil sand core are those in which it has superseded certain molding operations. Here the field for its profitable employment is extensive. In the replacement of mold cores that usually are lifted in the cope, it is particularly helpful to the molder.

A simple case of this description is illustrated by Fig. 6. The job is molded and cast face downward to ensure a clean surface for machining. Ordinarily special grids would have to be made for this type of job to carry the core formed from the spaces *P*. This would take a day or more, depending upon the size of the job, before molding proper could proceed. In some cases, owing to the shape of the casting, such as the presence of internal flanges, etc., which might possibly necessitate the destruction of the grids to remove them, it would be necessary to make a new set of grids for every casting. With the oil sand core, such a job may be negotiated successfully without resorting to special grids or lifters. In this way molding is simplified, time is saved, risk of scabbing practically is eliminated, gas troubles are diminished and the casting costs less to produce.

In the example shown in Fig. 6 the spaces *P* are treated as though they were coreboxes. Oil sand cores are made as follows: A little oil sand is spread over the bottom of each space. Upon this two or three crossed rods are laid for the reception of the lifting hooks by which the cores are suspended to the cope. The spaces are filled in with oil sand. A core is seen in position at *R*, with lifting-rod eye *S* for attaching to the cope. With the larger spaces, ashes would be used for the center of the core to economize on oil sand.

The pattern is covered with a plate, the job is turned over, and the cores removed on the plate to the oven. When the molder is ready to ram up the cope, he places the cores back in the pattern in their respective spaces, and by the loops *S* he secures each core to the box bars. The ramming of the cope then is a simple operation, in most cases merely that of an ordinary flat top part, no lifters being required.

Recommends Oil Sand

Then follows one of the greatest recommendations for the use of the oil sand core in this class of work. To arrive at a fair comparison the procedure necessary with the ordinary method where green sand cores are carried on grids and lifters should be considered. In such a case, when the cope is removed, it is usual to find that most of the cores have to be repaired. The sand, especially in the corners and narrow spaces, often remains behind in the pattern. In the larger jobs the mending may occupy a day or more, and each patch, however neatly executed, entails more or less risk of scabbing. The latter danger is largely a consequence of imperfect continuation of the venting.

Oil sand cores withdraw from the pattern without injury. The time necessary for finishing the cope is thus reduced. In most cases the molder simply passes a rim tool or an upset along the rib spaces between the cores to ensure close joints. Finally there is no risk of scabbing, and the castings are easier to dress.

This subject brings into prominence the necessity of pattern shop co-operation in extending the uses of the oil sand core. In Fig. 6 where a number of similar pockets appear in the top side of a pattern, as molded, the ribs, etc., need not be tapered or finished, as usually is the case. All that is required is a core box the size of one space, and a loose boss to produce the varying cores. In this way not only is time saved on the pattern itself, but the cores are easier to make out of a box than from spaces in the pattern. As these cores tend to swell laterally in drying the core box should be made slightly less, about 1/16-inch all round, than the spaces in the pattern.

Patternshop Should Co-operate

The oil sand core makes for economy in the pattern shop since core boxes last longer when used for oil sand than for dry sand. The ends of the boxes usually are best closed. This enables the core maker to use both hands for pressing the sand in the box. It is also an advantage to make the open side of the box flat so that the core may be turned out on to a level plate. The simplicity of the operations involved in making the oil sand core is the determining factor in cases where deep jointing or drawbacks are the alternatives, especially is this the case where a number of castings are required from the same pattern. Where the difference between forming a deep joint in the mold and making a dry sand core would not be sufficient to justify the expense of a core box, an oil sand core, being much simpler to produce, turns practice in favor of a core. This not only saves much work in jointing and mold repairing but also insures more uniform castings and reduces scrap.

Oil sand cores, again, form a perfect substitute for the loam plate, such as is built in a mold over lugs etc. From a plain frame core box a pile of such cores may be made in a fraction of the time and of course at much less cost, than it would take to daub dry and black loam plates. The oil sand cake has the further advantage in that it may be sawed up and shaped by the molder to a far greater extent than would be possible with a loam cake. It is firmer to handle in small pieces. Another use for the slab form of the oil sand core is that of its employment at the bottom of downgates. It is found to withstand the impact of the metal effectively.

From the above examples covering but a fraction of the ground explorable, one may safely assume that as confidence in the oil sand core grows, so its uses will be extended correspondingly. Here, as elsewhere, it is the

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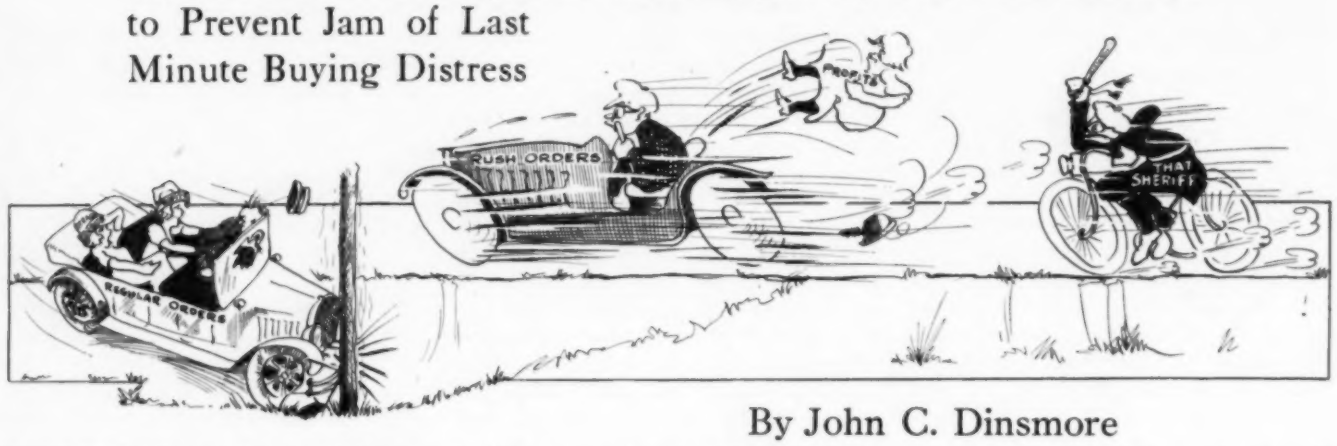
Rush Orders Complicate Traffic

Routine Business Might Be Encouraged By Price Concessions to Prevent Jam of Last Minute Buying Distress



By John C. Dinsmore

THE burden of the complaint entered against the purchasing agent in the third and last of the series of articles by A Victim entitled *What Does the Purchasing Agent Buy?* is the rush order evil and the fallacy of buying castings on price only.

The author complains that the purchasing agent frequently makes unjust demands for speedy delivery when the castings could just as well have been ordered far enough in advance to enable the foundryman to serve him well without undue cost. He points out the obvious fact that it is much less expensive to produce castings at the convenience of the foundryman than it is to produce them in a rush at the request of the purchasing agent.

It seems to me that the foundryman who knows that the goods he produces are being produced under uneconomic conditions owes an obligation to the community to see that this situation is changed. Let us assume that he is under these trying and uneconomical conditions, getting 5 cents a pound for his castings and that the added cost is about a half cent per pound. If he were to offer to sell the castings for 4¾ cents per pound, provided he could make them on his own schedule the purchasing agent would welcome this with open arms. If this were done both the foundry and the purchasing agent's firm would profit.

However, if I understand the workings of the mind of the foundryman correctly, he has no intention of offering to help the purchasing agent find a way to lower his costs even though he might indirectly add to his own profits by so doing. He is sore at the purchasing agent for forcing upon him conditions which leave little profit in the transaction for him. He rails at the purchasing agent for forcing upon him conditions which leave little profit in the transaction for him. He rails at the purchasing agent for his limited practical experience, but he makes no real attempt to find a solution of the difficulty which confronts him.

A Victim points out that a more careful planning and a more accurate scheduling of the orders frequently would reduce the labor cost of making the castings by 33 1/3 per cent, but he makes no move toward helping the purchasing agent find some way to help him save this waste effort. He seems quite content to make castings on any schedule as long as his profit is intact. How about the foundryman's obligation to the community? Is he not the servant of the community just as truly as is the doctor the dentist or the bishop? Has he—the foundryman— no responsibility in the age old endeavor to keep costs within bounds.

Again the foundryman is faced with the dilemma of the unprofitable order. If he accepts it he loses money, if he refuses this order he does not get a chance at the later orders that will pay a profit. Why does not the foundryman put his cards on the table. If he knows his costs and if his profit margins are fair and just, why does not he discuss the matter frankly with the purchasing agent. Instead of doing this he seems to be afraid of what the purchasing agent may find out about his costs and profits. The result is that both lose and another addition is made to an economic burden which is already too heavy.

As I have read these three articles by A Victim, I have become continually more certain that most of the difficulties and troubles complained of are due to the following factors.

Dislike and distrust of the purchasing agent on the part of the foundryman.

The foundryman's lack of accurate cost data.

Desire of the foundryman to secure an unduly large profit whenever the opportunity is afforded.

A complete disregard of this obligation to the community to see that operations are performed economically regardless of who may secure the immediate profit.

The second part of this most interesting article, March 15, is devoted to a discussion of the consideration of quality in purchasing castings. As I read this article I have a feeling that the thought in the back of the mind of A Victim was that the purchasing agent's firm would secure full value only if and when the order was given to A Victim at his own price. Many vendors seem to honestly believe this sort of thing. They refuse to admit that a competitor may cut prices without skimping on the product. They won't entertain the thought that the competitor might not only do this, but that he might by exercising ingenuity

still realize a profit. A Victim evidently feels that his costs are the right and just costs and that his profit is sacred.

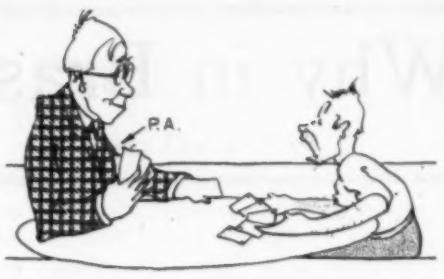
The attitude of A Victim toward costs is somewhat like that of two salesmen of leather-belt who recently called upon a purchasing agent of my acquaintance. The first salesman talked about as follows. "You know what leather-belt is. All belt manufacturers buy their hides from about the same sources. We all prepare the hides about the same way. The only difference between our belting and cheap belting lies in the fact that we select the hides and the cuts more carefully and give full weight. When you specify 30-32 ounce belt we give you full 32 ounces and the other fellow gives you scant 30 ounces. We give you the best belt and we have to get $2.00 per pound for it. We can sell you belt for less money but you don't want it."

The next salesman used almost exactly the same words, but named as his price $1.64 per pound. Both represented large reputable firms.

The foundryman does not always know his cost. When he does know, he frequently is unwilling to discuss them with the purchasing agent. Any attempt to discuss with him profit margins meets with a cold reception. Since the foundryman is not willing to put his cards on the table and since there are foundrymen who indulge in sharp practice, the purchasing agent may perhaps be forgiven if he wonders just how many cards are on the floor. He therefore spars for a lower unit cost, the foundryman gets panicky and quotes a too low price and gets the order at a loss.

The modern purchasing agent cannot disregard quality even if he wants to do so. Such a policy would be ruinous because of the downfall in the product of his own firm. He seeks price, quality and service and he is not only entitled to these three requisites, but he must have them if he would serve his firm and the community.

The real remedy for the troubles, trials and tribulations of A Victim is a frank discussion of the problem with that much maligned, but most useful member of society, the purchasing agent. He is the man with a thousand bosses and forty thousand critics. He it is who holds the solution to the ever present problem of the too high cost of goods. Treat him as you would a partner in a friendly twosome. Don't talk up to him. Don't talk down to him. Just ask him to



WHY does not the foundryman put his cards on the table? If he knows his costs and if his profit margins are fair and just why does not he discuss the matter frankly with the purchasing agent?"

help you to serve him and the community better and see what a ready response rewards your efforts.

To Begin Production

The Superior Bronze & Aluminum Co., Warren, O., which recently was organized with $20,000 capital to engage in general job casting specializing in steel mill requirements was placed in operation Aug. 1. The company has a new plant which is modern in every respect as to equipment and construction, 40 x 120 feet, with a capacity of 75 to 100 tons of castings a month. Gas and oil furnaces are to be used.

A. T. Gilmour is president and general manager of the company. He has had 30 years experience in bronze and aluminum casting work and formerly was superintendent of the Nathan Mfg. Co., New York, the Eynon-Evans Co., Philadelphia, Paxton Mitchel Co., Omaha, Nebr. and the Trumbull Bronze Co., Warren, O.

Plan Exhibition

Concurrently with the convention of the Institute of British Foundrymen, which will take place in London in June, 1926, an International Foundry Trades exhibition will be held from June 10 to 19 at the Royal Agricultural hall, Islington, London. This exhibition will be under the patronage and with the active support of the Foundry Trades' Exhibition & Supplies Association, Ltd., and of the Institute of British Foundrymen. One of the objects of the Foundry Trades' Equipment and Supplies association which was recently formed is to support such exhibitions as the one which is contemplated, thus assuring the cooperation of numerous members of the association. The organizers of the exhibition are F. W. Bridges & Sons, Ltd., Avenue Chambers, 4 Vernon Place, Southampton Row, London, W. C. 1.

Institute Meet Brings Out Many Papers

During the first day's meeting of the British Institute of Metals at the Institution of Engineers & Shipbuilders of Scotland, Elmbank Crescent, Glasgow, Sept. 1 to 4, Sir John Dewrance will deliver a lecture on Education, Research and Standardization. The mornings of Sept. 2 and 3, will be devoted to the reading and discussion of 16 papers dealing with many different aspects of metallurgical work.

The Effect of Low-Temperature Heating on the Release of Internal Stress in Brass Tubes, by R. J. Anderson, Pittsburgh, Pa.; Colloidal Separations in Alloys, by Prof. J. H. Andrew and Robert Hay, Glasgow, Scotland; The Influence of the Time Factor on Tensile Tests Conducted at Elevated Temperatures, by John S. Brown, Greenock, Scotland; Passification and Scale Resistance in Relation to the Corrosion of Aluminum Alloys, by L. H. Callendar, London; Zinc-Cadmium Alloys. A Note on their Shear Strengths as Solders, by R. B. Deeley, London; Thermal Conductivities of Industrial Non-Ferrous Alloys, by J. W. Donaldson, Greenock, Scotland; The Influence of Pouring Temperature and Mold Temperature on the Properties of a Lead-Base Anti-Friction Alloy by Prof. Ellis, Toronto, Canada; On the Constitution of Zinc-Copper Alloys containing 45 to 65 per cent of Copper, by Marie L. V. Gayler, Teddington, England; The Effect of Temperature on the Behaviour of Metals and Alloys in the Notched-Bar Impact Test, by A. H. Greaves and J. A. Jones, Woolwich, London; On the Constitution of Alloys of Aluminium, Copper and Zinc, by D. Hanson and Marie L. V. Gaylor, Teddington, England; The Transformations in Copper-Zinc Alloys, by J. L. Haughton of Teddington and W. T. Griffiths, Woolwich, London; The Properties of some Aluminium Alloys, by Harry Hyman, Glasgow, Scotland; The High Temperature-Tensile Curve (a) Effect of Rate of Heating (b) Tensile Curves of Some Brasses, D. H. Ingall, Wednesbury, England; The Physical Properties of the Copper-Cadmium Alloys Rich in Cadmium, by C. H. M. Jenkins, Teddington, England; The Primitive Copper Industry of America, by G. B. Phillips, Philadelphia, Pa.; The Alpha-Phase Boundary in the Copper-Tin System, by D. Stockdale, Warrington, England.

Visits will be paid to works in the Glasgow district in the afternoons and in the evening of Sept. 2 a reception will be given by the Lord Provost, the magistrates and corporation of Glasgow. The last day of the meeting, Sept. 4, is set apart for a trip to the Trossachs and Loch Lomond. The reception committee, presided over by Lord Weir of Eastwood, has organized a number of entertainments for the ladies who will be present.

Foundrymen Hold Outing

Mid-summer outing of New England Foundrymen's association was held on Aug. 12, at Providence, R. I. A shore dinner followed by an attractive entertainment and cabaret was a feature of the day's program.

How and Why in Brass Founding

By Charles Vickers

Tensile Strength of Gun Metal

We would like to obtain figures regarding the tensile strength of the alloy known as gun metal, 88-10-2.

A few years ago 500 pounds of the alloy 88-10-2 was made up by the bureau of standards and distributed to five brass foundries. Each of the five made test bars, casting them flat in green sand; flat in dry sand, vertical in green sand, vertical in dry sand, and one set each cast in chill molds. One set was cast from virgin metal, another from remelted metal and a third a remelt of the first two melts. The average results follow:

	Tensile strength lbs. per square inch	Elongation on two inches per cent	Reduction of area per cent
Virgin melt	39,200	13	10 sand cast
Virgin melt	44,100	28	23.7 chill cast
First remelt	35,300	10.5	9.1 sand cast
First remelt	44,300	24.6	19.8 chill cast
Second remelt	37,900	10.5	11.5 sand cast
Second remelt	31,600	4.0	6.0 chill cast

Further particulars may be found in Vol. 10 *Transactions* of the American Institute of Metals page 77-89.

Much better values than the above have been obtained from test bars of 88-10-2, as the strength of the bar is influenced tremendously by the manner of casting it. On page 448 "Metals and Their Alloys" (Vickers) a method is illustrated for making test bars of gun metals, red brass and manganese bronze that will give high values. The most important matter to attend to when making test bars of such alloys is to feed the bar from a reservoir of molten metal and avoid any absence of eutectic between the crytsals, usually shown by a yellowish colored area on the bar being fractured.

Test bars so cast, are not representative of the casting unless the latter has received the same treatment as the bar. Therefore high values may be said to merely show off the skillfulness with which the bars were molded and cast.

Linings Give Trouble

Lately we have experienced trouble with the lining of a noncrucible oil-fired melting furnace used for nickel and monel metal. We use a high temperature cement of exactly the same grade as formerly, and we are of the opinion it is inferior to that supplied in the past. We would appreciate your recommending some other cement. As the foundry use of such metals as nickel and monel requires special skill we will appreciate any suggestions you may offer us.

We suggest that as the refractory cement has given satisfaction in the past that no change be made until the matter of its present unsatisfactory performance is brought to the attention of the manufacturers of the cement, as they likely will be in a position to make suggestions, which if followed will eliminate the difficulties. For other cements we suggest a perusal of the advertising columns of THE FOUNDRY.

Nickel and its alloys are more difficult to handle in a foundry because the melting point is near that of steel, and more success attends those who face the molds with a refractory sand mixture, similar to steel founding practice. It is necessary also to use deoxidizers, in which connection manganese and magnesium are used extensively, but the alkali earth metals are more satisfactory.

Keep Iron Away

We are making yellow brass castings but experience considerable trouble due to inclusions of dross and gas, the dross being visible on the skin of the castings and the holes appearing after machine work has been done. The molds are made in a fine grade of brass sand, and the metal is melted in coke-fired pit furnaces, but we do not have any method of determining the pouring temperature of the brass, this being judged by the foreman. Any suggestions will be highly appreciated.

When dross difficulties show up in the case of brass castings it always is advisable to have an analysis made with particular reference to the iron and aluminum content of the metal. The information so gained is illuminating to the one who can interpret it. We suggest that care be exercised to keep iron away from the brass and while it is not necessary to use carbon stirrers, as iron ones can be used, the latter should not be immersed long enough to dissolve to any great extent. Both the castings submitted contain iron oxide inclusions as determined by analysis of the skin of the castings, and we suggest a careful scrutiny of the operations involved in making the castings to determine where this impurity has been picked up. Then simply take precautions not to pick it up, and the trouble will largely vanish. As far as the sand is concerned the castings tell no tales, but it should be remembered that fine brass molding sand is not sufficiently open in texture to permit of castings as heavy as those sent without some difficulty from gas holes. Therefore, it might be a good idea to open up the sand by mixing with some new sand of a little coarser grade.

Making Slush Castings

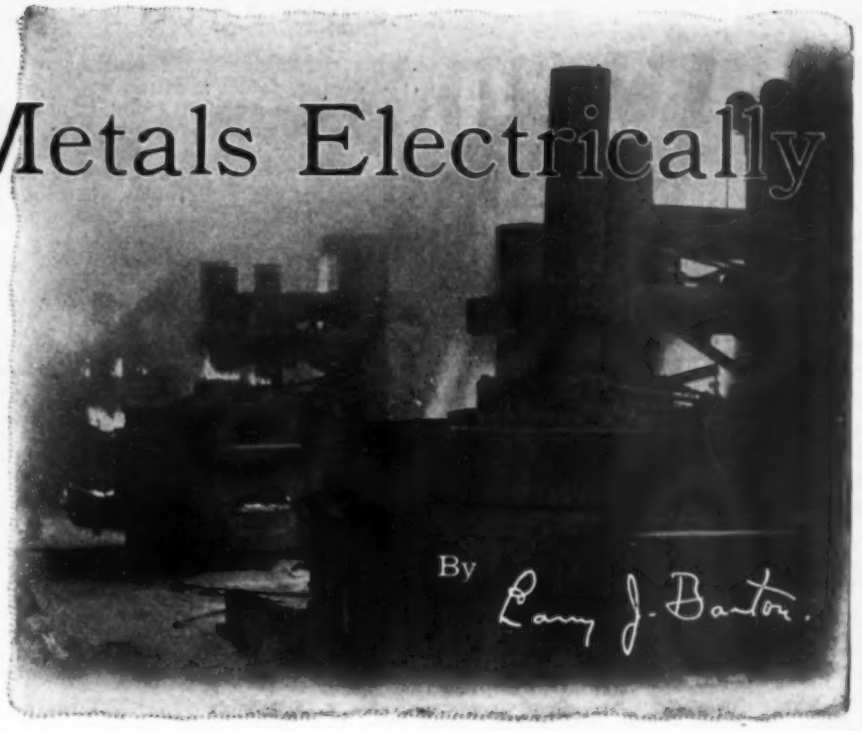
We would like to learn how to make slush molds. We use the French sand finely sifted, packed hard against the pattern, sprayed and then skin dried with a blow torch. We would like to know if this is the right way to do this, and how to get the bright natural look to the castings.

A slush mold is a metal mold which may consist of many parts and which is heated, then filled with molten spelter, and after a certain interval this spelter is slushed out leaving a thin shell of metal which constitutes the casting. In other words it is a method of making castings without using cores to get them hollow.

We are unable to understand the kind of castings being made in French sand. Unless there is a lot of undercut parts, we should think a fine facing of Windsor Locks or other fine molding sand would produce better results in the way of a smooth finish. It is necessary to print back the face of the casting to get a smooth and fine finish in the case of ordinary jobbing castings. To get a specially fine surface on the first ramming requires a facing that has been specially and painstaking prepared, and the printing back is easiest in cases where merely a small number of castings are to be made.

To print back, lift the face in the cope, spray well, then using a fine bag, dust evenly all over the impression with Windsor Locks sand, and on this dust lycopodium, and remember there is no substitute therefor. Close the mold and reram lightly with the butt rammer, lift off, dust finely with flour, then skin dry and cast while the mold is hot.

Refining Metals Electrically



Chapter VIII

Different Classes of Ladles Contrasted—Pouring Practice

ONE of the most important, yet least considered points in the majority of modern steel foundries is the care and preparation of ladles, and the practice pouring followed in molds. Many castings are lost through gross carelessness or lack of knowledge on these details. In some shops the actual pouring is under the direction of the melter. In others the foundry foreman supervises this feature. Unless the practice is well established difficulties ensue. The melter knows the temperature and condition of his metal, yet may remain in ignorance as to the peculiarities of each casting poured. On the other hand, the molding foreman knows exactly what is in each flask poured. Further, the molding foreman may be ignorant as to the characteristics of this particular heat of metal. The evident result is that some molds are poured too slow, others too fast, hot metal may be poured into castings requiring the deadest sort of steel and soon.

Even when the person who supervises the pouring possesses sufficient knowledge and discrimination to judge the pouring operations, ladle trouble, with its many obstacles often arises to throw out of gear all previous calculations. Pouring the heat is as important as the making of the steel itself, for what value is excellent steel if the mold is spoiled by improper handling. As in most foundries the furnace operator is in direct charge of the ladles and the pouring it has been thought wise to include some data on this subject.

Classes Of Ladles

Three main methods are used for handling steel from the furnace to the mold at the present time. These are the common lip-pour ladle, such as predominates in iron foundry work, the tea-spout, and the bottom pour ladles.

The lip pour ladle consists of a brick lined steel pot, suitably arranged with gearing to tilt it. This type ladle has been adopted through familiarity with iron foundry work for many years. The ladle offers certain advantages. There is a certainty of being able to pour the heat with no difficulty from a leaky stopper, or any chance of the spout freezing as with other types. The one in charge of pouring is able to tell with great certainty the amount of metal remaining in the ladle after a great part of the heat has been poured, with its attendant saving in castings poured short. Finally, accurate control of the stream of steel being poured into the mold is possible.

These merits pass into insignificance when the disadvantages are studied. In the first place, the steel, as it continually pours over the lip, always is in contact with the cold air, the result being that there is a rapid chilling effect on the metal. This requires that the metal be heated to higher temperatures with increased cost. It results in more ladle skulls, and more castings lost from cold metal, both of which are costly. The second important count against this piece of equipment is the great difficulty in keeping the slag back during pouring. Often considerable quantities of slag enter the mold with the metal and result in defective castings.

As high heats are necessary, the ladle itself must be highly heated. This requires more oil, which with the hotter metal, and heavy skulls give less tonnage on a ladle lining. These disadvantages are such that the use of this class of ladle is rapidly declining. Lip-pour ladles today are used mostly in shops where a small amount of metal is poured at one time, or in those under the direction of old school foundrymen.

Tea-Spout Ladle

The tea-spout ladle consists of an ordinary lip-pour ladle with an attachment similar to the spout on a coffee or tea pot, from which its name is obtained. This supplementary spout is so arranged that the metal

What Price Ladles?

STYLES and kinds of ladles for steel foundry use differ. Doubtless the three leading types, the lip-pour, tea-spout and bottom-pour, all have their advocates, although the author of this series of articles favors the latter. He contrasts the merits and faults of the various kinds of ladles, gives the precautions which should be observed in preparing and using the ladles and suggests many practical kinks which have for their object increased life and reduced cost in ladle service. When the ladle maintenance cost is measured against the expense of lost castings, metal pigged because it is too cold to pour castings and the other troubles encountered, the balance undoubtedly is in favor of slightly higher ladle expense. Such expense is in effect an insurance charge against the other difficulties mentioned.

from the bottom, or near the bottom, of the ladle passes up through this spout and is poured. This means that the metal is taken from under its covering of slag and has two main advantages: First, there is little trouble due to slag interfering with the flow of steel over the lip. Second, the blanket of slag covering the steel is not disturbed and aids greatly in keeping part of the heat of the steel within itself. This does away with one of the main counts against the lip pour ladle, yet the majority of the disadvantages inherent in the original ladle still are contained in this later modification. There is a great tendency for the metal to get cold and freeze in this tea-spout. The ladles must be highly superheated, as must the metal also. In short, this type of ladle is nothing but a self skimming lip-pour ladle with all the weak points of the latter. Such ladles, on account of the surety of pour, are widely used and may be considered as a common piece of steel foundry equipment.

Bottom Pour Ladle

The bottom pour ladle has been in use for many years, especially in basic, open-hearth steel work, where great care must be used in the separation of slag from steel. This type of ladle is exactly like the lip-pour ladle except that the metal is poured through a hole in the bottom of the ladle itself. This hole is made by inserting a special brick in the ladle bottom and tightly ramming it into place. The top end of this brick has a circular depression into which fits the end of a long, covered rod, known as the stopper rod. This rod is so arranged on a system of levers that it may be raised and lowered, opening or closing the bottom opening in a manner similar to removing and inserting a cork in a bottle. Such an apparatus has the following manifest advantages:

As the steel is taken from the bottom of the ladle, there is but little possibility of ever obtaining slag in a casting.

The slag, after it is tapped, forms an air tight blanket over the surface of the metal, and during the pour is not disturbed. The main result of this is the slight loss of heat from the metal, consequently the steel may be poured throughout the pouring period at much higher temperatures than is possible with the other types of ladle.

Due to this arrangement there is no skimming to be done during the pour. This gives a saving in labor.

With the great saving of heat in this method, there is no necessity for heating the ladle to such high temperatures before the metal is tapped into it, making a considerable reduction in the amount of oil used for ladle heating.

With the possibility of less heating before the metal is tapped, and with the ability to pour much colder metal successfully the life of such a ladle lining is greatly prolonged, making the refractory cost considerably less.

With less chance of skulling, the amount of labor to reline and keep such ladles in repair is far lower than on the other types.

As the temperature of the metal remains higher during the pour than with the other ladles, there is considerably less skulling, less spilled metal, and much less metal cast into pigs when too cold to run a casting.

Due to the ease of handling such a ladle, less time and less labor are required to pour a specified amount of metal than with the others.

In certain instances a large nozzle brick may be used, and metal can be poured into large castings, so cold that it would never get over the lip of the other classes of ladles.

However, it is but natural that this type of ladle should also have its disadvantages, as with the tea-spout ladle, there is more uncertainty to the pour, caused by troubles with the nozzle leaking, the rods burning through, etc. Cost is increased each heat by the amount of one stopper head, one nozzle brick, and 5 or 6 sleeve brick, plus the extra cost of upkeep on the rods, pins, etc. It is difficult to know the exact amount of metal left in the ladle toward the end of the pour. This increases the chances of pouring a casting short. There is a certain amount of uncertainty in knowing the exact temperature of the metal until the stream is started, often causing hot metal to be poured into a large heavy mold. As this is more carelessness than the fault of the ladle it cannot be used as a count against this type of equipment.

Personally, the writer knows from experience, that the advantages of the bottom pour ladle are so great that a shop should not be considered as turning out a high grade product unless such equipment is used. Not only is this ladle far superior from the standpoint of quality, but it is far ahead of the other types in cheapness of operation. While it is true that the rod equipment costs more per heat, the great saving in other items far overbalances this slight cost. The speed and ease of pouring, the lack of spill, skulls, pigged metal, less labor, etc., constitute great economies at the end of a year's operation.

The other side of the story is this:

"Yes we have tried bottom pour ladles, but they gave us so much trouble that we had to quit them. They may be all right, but we cannot take any chances with our product."

The trouble with the objector in such an instance is this. His shop has tried the bottom pour ladle, but in the hands of a man who did not know how to operate one, or under the supervision of a melter who was not acquainted with the peculiarities of its operation. One would not expect an automobile driver to step into an aeroplane and do stunt flying at once, so why expect a green man to operate something which is difficult even to the experienced ladleman.

The efficient operation of a bottom pour ladle is an art, and one in which as much experience is required as in successful steel melting. It is perfectly true that trouble is encountered due to leaky stoppers, etc., but what can be worse than a frozen tea-spout, or a frozen lip pour ladle, or a heat where a great part must be poured into pigs. The writer has supervised bottom pour ladles for many years and has had his troubles, yet they were insignificant when the total of perfectly poured heats are considered.

Maintaining Ladles

Regardless of the type of ladle used, there are certain points in which all are equal. The first question which confronts the new shop is whether to use a rammed ladle lining or one of brick. While the writer favors the brick lined ladle, there are many successful shops that use nothing but rammed linings. Personally, the writer has found the brick lining is better in service, gives longer life and is far cheaper in the end.

If a rammed lining is to be used, it will be necessary to build a wood form with a diameter such that when placed in the ladle, it will allow the desired thickness of lining around the sides. This form is best made in sections so that as the bottom section is rammed, the height may be raised. This allows better and harder ramming for each successive layer, making the lining more homogenous and of a more durable character. The bottom of the ladle should be laid of a good quality fire brick, usually two rows laid flat being used, and properly cemented into place with fire clay or with some good refractory cement. The wood form then is placed in position and the refractory material rammed around it until a section the depth of the form has been rammed. Another section is placed in position and this operation is repeated until the material has reached the top of the ladle. The different classes of refractory used are so many that it is needless to enumerate them, but nearly all consist of some sort of

a ganister mixed with a binder such as glutrin, sodium silicate, or some refractory cement, mixed to a stiff mud and tightly rammed, in a manner similar to placing an acid hearth in place. In certain instances, where a basic lining is used as in manganese steel ladles, a mixture of magnesite is used with a proper binder.

After the ladle is completely lined, it is allowed to stand for several hours, often over night, until the refractory has had a chance to air set. Then the form carefully is removed and a low fire is started in the ladle. This heat is gradually increased until a hot fire is attained in the ladle. This is continued until the lining has dried thoroughly. The fire never should be forced at the start as this will result in scabbing the refractory and often will cause large patches to spall off. Generally six or eight hours are required to thoroughly dry a 3-ton ladle, the usual method being to start the fire about noon, run slowly until 3 o'clock, when the fire is increased, until at about 4:30 it is extremely hot. Sufficient coke then is added to keep the fire all night, the ladle being dry next morning, and only requiring the oil flame to set the refractory. The flame is placed on the ladle and it is run until white hot, and dripping if possible, when it is shut down and the ladle is ready for steel.

Lining Ladle With Brick

The bottom is placed in the same way in a brick lined ladle, but the walls are formed of arch bricks, shaped to fit the contour of the ladle, and laid in a heavy mud so that no cracks remain. When completely lined a fire is started. This may be run high from the start with no danger from spalling. After the ladle is thoroughly dried the mud is plastered over the joints and every crack filled when it is ready for its first heat. The great advantage of a brick ladle is its strength throughout the mass, with no tendency toward spalling of large patches, or to crumble under increased heat.

After every heat, ladles should be chipped carefully to remove small metal skulls and adhering slag. Any small worn spots should be mudded. As soon as a ladle develops a spot which is thin, or which looks dangerous, it should be removed and new bricks placed in position. About two two inches of molding sand is rammed over the bottom to protect it from the falling metal stream. This should be inspected carefully after every heat to make sure that it has not cracked or that there is no metal hanging.

FIG. 55—SURFACE DEFECTS IN NOZZLE BRICKS ARE GROUND BY A CAST IRON OR STEEL GRINDER OF EXACT STOPPER DIMENSIONS AND WITH A NICKED GRINDING FACE

Small skulls left in a ladle are a prolific source of trouble and often cause the metal to chill around them resulting in serious freezing.

Preparing For Steel

Assuming that the ladle is lined, the bottom placed in position and thoroughly dry, the next step is the actual preparation of the ladle for the steel. If a lip pour ladle, the requirement is to form the lip itself, which is best made in the shape of a deep rounded *V*, over which the steel will pour in a light stream, its amount being controlled easily.

For tea-spout ladles the spout itself must have attention. This is lined like the ladle, but usually is made of some rammed material, as it must be changed after every few heats. The spout may be made in two ways, either outside of the ladle proper or inside of the ladle. The outside lip has certain advantages in that it is accessible, through having a removable face plate, in case of having to remove a frozen stub from the spout. For this case a counterweight is required on the opposite side of the ladle, and a little more difficulty is encountered in pouring the steel, due to the heavy off center overhang. Regardless of the position of the spout relative to the ladle, it will consist of a long tube, probably 4 or 5 inches in diameter, connected with the body of the ladle by an open space through which the metal can enter this pipe. In heating, this class of ladle always is laid on its side against a wall with the spout up, so that this section of the ladle is the hottest. Such a ladle will give trouble unless the spout is white hot before the metal is tapped into it.

On pouring from such a ladle, a few large castings should be poured first so that the metal running over this lip and up through the spout, may have a chance to heat the colder sections which are exposed to the air. As soon as the spout is hot and the steel pours clean over the lip, smaller castings may be poured, until the metal begins to chill when all haste possible must be used to get the metal out of the ladle. In case of the spout freezing there is nothing which can be done except pour the metal over the opposite lip. For this reason, a good lip should always be provided on the side opposite to the spout for just such emergencies.

Tea-spout ladles find their widest use in the smaller shops where metal in amounts under 3 tons is poured at one time, although the writer knows of several operating in shops pouring up to 7 or 8 tons at a time where a large amount of this metal is shanked from the large ladle to pour the side floor work.

Bottom Pour Practice

In making the bottom of a bottom pour ladle a small hole is left over the nozzle plate, this hole being approximately 12 to 14 inches square. The nozzle plate is a ring shaped plate bolted to the ladle bottom upon which the shoulder of the nozzle brick rests. When the nozzle is set, it is placed in the center of the hole resting on this plate, and in an exact perpendicular position. Tempered molding sand is rammed tightly around this brick to hold it in position, the sand being so rammed that the brick is at the lowest portion of the ladle, the bottom sloping gradually up and away from this brick. This assures a clean drain of the metal from the ladle and prevents bottom skulls. This brick never should be allowed to be in a hole in the bottom with abrupt walls, for if so placed there is the chance that the rod during the pour, might slip sideways a little, and the hole would be so steep that it would not slip back into place. This would result in serious run out.

Setting the nozzle is an important operation and the greatest of care should be exercised in the selection, testing, and placing of this brick. These nozble bricks are so designed that the upper portion of the face is concaved, and it is around the rim of this section where the stopper rod fits to seal the opening. The brick selected should be one which has a smooth face and it should be tested for its correct contour before

setting. The method of testing such a brick is to place it on a bench and setting a standard stopper head on it in the exact position which would follow if in the ladle. This head is rotated against the brick, with a slight pressure, and the black ring caused by this contact observed. If this brick has a perfectly round and uniform face, the ring will be a perfect black circle. If not, bare spots will show, denoting either small lumps or depressions in the brick's surface.

If the lumps or depressions are slight it will be permissible to use a grinder to bring the surface to its proper shape. Such an implement is shown in Fig. 55. This consists of an iron or steel casting, of the exact shape of a stopper head, being machined to these dimensions. The upper or bearing surface is nicked with a chisel so that as this head is rotated against the rough surface of the brick its abrasive action is such that it wears away the uneven spots and brings the brick to such a shape that the fit of the latter head is perfect. Too much grinding is not permissible as the absolute removal of the bricks' surface offers a soft spot which will be cut away under the influence of the hot steel. As soon as the shape of the brick is such that a perfect fit of the stopper head is assured, by the absolute regularity of the black circle, the head is placed on the brick and a small amount of dry fine sand placed around the head where it rests against the brick. If the joint is tight enough to hold the sand, the fit is satisfactory, and the nozzle is ready for the ladle. A nozzle never, under any circumstances, should be used without this sand test.

Bricks will be found which are so uneven that they will require heavy grinding to bring to shape. These bricks may be saved for use on heats where only one or two stops are to be made which will take the greater proportion of the heat, so that there would be slight danger of trouble even though the stopper allowed a light dribble after the first opening. When the nozzle brick is rammed into place in the ladle care must be used to see that the brick is centered properly on the nozzle plate, that it is absolutely perpendicular and that the ramming is so tight that there is small chance of the brick working loose and allowing leakage.

Extending Uses of Oil Sand Cores

(*Concluded from Page* 653)

first step that counts. The pioneer spirit is essential for success. It will demonstrate that although the foundryman may be notoriously conservative he also is pre-eminently practical. Though he may start with a strong bias against the use of the oil sand core he is bound, ultimately, to reach the conclusion enunciated by a certain competent molder who, after condemning it without trial, finally admitted, when he found that it saved him a great deal of work that there was something in it after all.

In conclusion, what of the coremaker, the individual most immediately concerned in this matter? Does his job become better, or worse by extending the uses of oil sand? Decidedly better. His status is bound to improve as his services are requisitioned increasingly. Then again, with oil sand the need for laborious, hard ramming becomes a thing of the past. And no one can deny that oil sand is far healthier and infinitely more pleasant to handle to the coremaker.

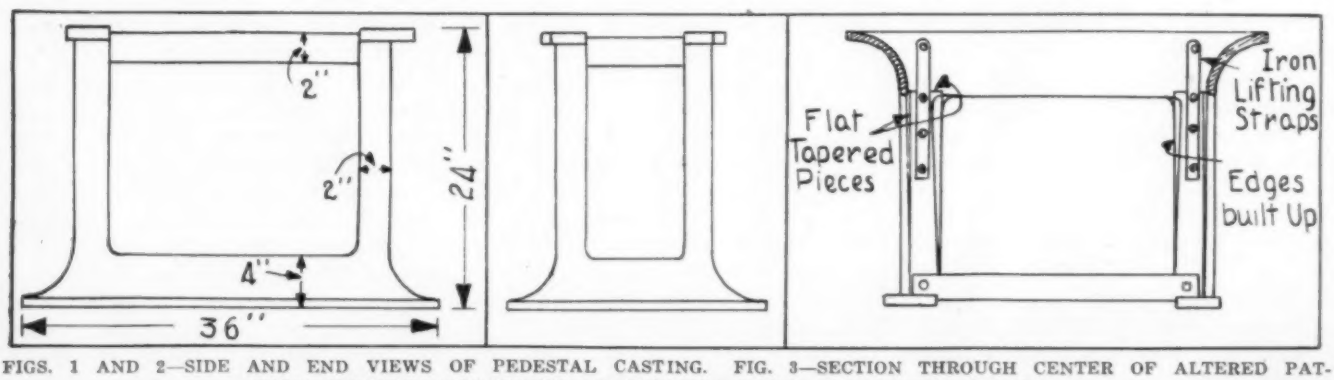
Pattern Is Altered To Facilitate Work

BY DONALD A. HAMPSON

SEVERAL methods are available for molding the pedestal shown in the accompanying illustration. If the foundryman had to make his own pattern he might choose to make a solid box and form the inside of the casting with a large dry sand core. He might dowel the flats and rails in place and either cover them with flat cores or use a three-part flask in which the cheek is lifted off after the main pattern is drawn. He might dispense with the flats and rails on the pattern by placing them in suitable coreboxes. The pattern automatically locates the cores in place, after which the drag is rammed full of sand up to the joint line.

However, occasionally the customer supplies the pattern and then the foundryman is up against a condition and not a theory. The pattern shown in Figs. 1 and 2 was designed to be molded in a deep drag. The feet and rails were loose and were removed when the sand was rammed to that height. The cavities were covered with flat cores, the remainder of the drag was rammed full of sand. The drag then was rolled over and the remainder of the mold was made in the usual manner. The idea was feasible, but the pattern had no draft on the long legs and caused the sand to break away around the feet.

After consultation with the customer the pattern was changed as shown in Fig. 3. The legs were drafted liberally and no further trouble was experienced. Pieces of ½-inch stuff planed down to nothing were tacked on the outside edge of the legs. The legs themselves were sprung inward about ⅛-inch to provide draft on the outside. A 3/16-inch pine strip was planed down to nothing at one end and tacked inside the angles of the legs. These changes added relatively nothing to the weight of the casting, but they insured a clean and easy draw for the pattern.



FIGS. 1 AND 2—SIDE AND END VIEWS OF PEDESTAL CASTING. FIG. 3—SECTION THROUGH CENTER OF ALTERED PATTERN SHOWING APPLICATION OF TAPERED STRIPS AND LIFTING STRAPS

Bill Comments on the Luck of the Foundry

BY PAT DWYER

MANY years ago when I had more money and less sense than I have now I was bitten by the photographic bug and thereby induced to buy a camera. The extent of my financial resources and the virulence of the attack may be approximated when I state that I willingly, nay cheerfully paid $20 for the thing. Gaged by modern standards the sum is not alarming, but at the time $20 represented about seven day's wages and with all due respect to financial and other wizards I still am old fashioned enough to reckon the value of things as compared with my earning capacity.

The stickler for accuracy may claim that the proper manner in which to calculate the amount legitimately spent for luxuries depends upon his actual needs as compared with his income. This is a nice point, but as I never have been able to decide just where actual needs ended and luxuries commenced, I am not in a position to rendér a definite ruling on such a delicate and debatable subject. The only feature of the controversy on which I have settled convictions is that I derived a great deal more than twenty dollar's worth of fun from the investment and the interest has been spread over a great many more than 20 years.

'Tis true the first keen enthusiasm flickered and went out after a few years and I no longer felt a wild and overwhelming desire to shoot at everything in sight. I became more particular in the choice of subjects. More from a natural grabby instinct that prompts me to keep things, rather than from any knowledge that eventually the pictures might be valuable, I kept many of the prints and pasted them in a scrap book. I look over them now occasionally and realize that from a sentimental view point I have a treasure beyond price.

In my early camera days I was foot loose and fancy free and drifted blithely from place to place at my own sweet will and pleasure. For a time I was handicapped by the possession of a trunk and a toolbox, but when I discovered that none of my contemporaries burdened themselves with any such evidence of their connection with the idle rich, I dispensed with both. The tools were packed in a long, narrow canvas bag closed with a draw string and the few spare clothes easily were rolled in a newspaper at a moment's notice. At one stroke I was relieved of all the trouble incident to checking my baggage, to hiring an expressman to drag it to the station or the boat landing in one town and the further trouble of securing another pirate to cart it to a boarding house at my destination.

Those old days are long past, but even yet when I fare forth decorously for a limited time from home, I travel light, greatly to the annoyance of a certain lady who if she had her way would burden me with enough junk to spavin a camel. I tell her politely but firmly that my arms were stretched about three inches beyond their normal length through carrying heavy ladles of iron in the days of my youth and I have no desire to stretch them further by dragging heavy grips all over the country. Her usual comeback is that it is a pity I am not as careful of my tongue as I am of my arms.

However, all this has nothing to do with the ownership and use of the camera. It simply is introduced here to illustrate the point that I covered quite a respectable territory with full stopover privileges in any town that engaged my fancy. Foundrymen graciously were pleased to accept my services at these various stops and as the remuneration was reckoned on an hourly basis I was free to quit at any time I felt the gypsy urge to move along. A few months usually satisfied my curiosity in any one town and I had neither the need nor the inclination to work in more than one shop. It was a carefree independent life and I carried away a few pictures from each place.

Eventually I married and that effectually put a stop to my rambling. I still continued to take pictures but the character of the subjects that appealed to my taste gradually changed. At periodic intervals several young visitors arrived at the house. They were total strangers at first without either baggage or credentials, but we accepted them on faith and the attraction seemed to be mutual. At first they were inclined to be a trifle distant and displayed a marked indifference to their surroundings. They had to be handled with the greatest care and diplomacy, but eventually they became reconciled to their modest surroundings and decided to remain indefinitely. I made pictures of them shortly after their arrival, while they were creeping around, after

THE PRODIGAL RETURNS TO LOOK 'EM OVER

they had learned to walk and at various stages of their progress since that time. The years came and went, each succeeding year flying more rapidly than the one which preceded it and when I pick up the scrapbook now I am tempted to doubt the evidence of my own senses. The faces and forms that meet my gaze as I occasionally throw a fatherly eye over the family circle bear little or no resemblance to the cute little cherubs that once faced the camera. On this point also I find a marked difference of opinion between the boys and girls in regard to my artistic sense. Several of the pictures were taken when the subject had on little more than a smile. The boys point to these with pride and direct attention to the beautiful symmetrical curves and noble muscular development displayed. The girls show a lack of enthusiasm and in fact intimate that I displayed a deplorable lack of taste and propriety in my early photographic efforts.

On occasions like this I sigh heavily and take another look at the dimpled arms and little pink toes. I had no shoes to buy in those days. I have kept no records and therefore can not submit any actual figures but I have bought quite a few shoes since that time. Keeping well within conservative bounds and basing my opinion solely on my recollection of the demand for shoes and more shoes I think I am quite safe in stating that if all the shoes I have bought in the past 20 or more years were placed end to end they would extend in a straight line from Fire Island light to the Golden Gate.

Bill came in the other night while I was turning over the pages and recognized many of the pictures. He was not particularly interested in the pictures of the children or the outdoor views of the various cities and towns. Inside views of foundries, odd and peculiar castings and groups of workmen claimed his closest attention. At one time or another he had been acquainted with many of these men and in some mysterious manner had kept track of their movements in the intervening years.

"You often hear the statement" said Bill "that a man carves out his own destiny. That all he has to do is to set his eye on a certain goal and then keep plugging away until he arrives at that point. Take it from me, my lad, that is nothing but the purest and most undiluted species of drivel. A comparatively small number of men follow one line consistently and finally achieve success, but the great majority may be compared to corks floating on the stream of chance. They are buffeted by head winds, they are caught in eddies, they drift into back waters, they are submerged by sudden and unexpected squalls, they are rammed and sunk by larger corks, they are stranded on sandbars and when the Goddess of Chance flies over the water distributing prizes they draw a blank or are lost in the shuffle.

FOUNDRYMEN ENJOY A LITTLE BLOWOUT

"Consider a concrete example where the foreman of a foundry dies or quits voluntarily or involuntarily. There may be half a dozen men in the shop quite competent to assume the position. Obviously, only one man can be appointed. It is only natural that each of the other five men should feel that he was born under an unlucky star. In my own personal experience I have known many incompetent men falling consistently from one good job into another. They run a bluff for a short time, but almost invariably before the skids are slipped under them another and more attractive position is offered them. On the other hand I know highly competent men who are forced out of positions through circumstances altogether beyond their control, while the number of men of executive caliber who never get an opportunity of exercising their talents is legion.

"So many factors enter into the warp and woof of industrial life that it is idle to claim that chance or fate or luck—call it by what name you will—does not exercise an important influence.

"Modern industry is an autocracy. I am not a socialist, a communist or a bolshevicky and am not making this statement in a derogatory sense. I recognize it is the only system under which business can be carried on successfully, but so long as it is an autocracy, the appointment of one man to a position of authority depends on the personal whim or discretion of the man up above who appoints him.

"Solomon long ago said, 'Three things I know not, the way of a serpent upon a rock, the way of an eagle in the air or the way of a ship upon the sea.' If he had lived today he might have added another, the way of a foundry owner in appointing a foreman. So far as I know I am not related to Solomon, but I should like to add one more item to the list and that is I do not know why some men get all the plums while others get nothing but hard knocks, sour looks and invitations to keep out, this means you. A couple of years ago I spent a short vacation in the old town where I had learned the trade and among other points of interest I visited the different foundries. Nearly all the men and boys I had known had disappeared but in the last shop on the list, a steel foundry that had been established in recent years, I found an old acquaintance. No less in fact than the old gaffer under whom I had served my time. He was an elderly man ornamented with a long beard when I was a boy and in the natural course of events I had assumed that he long since had passed to his reward. I had some difficulty in turning a mental handspring and recognizing my old friend in the tall, erect, alert and smoothly shaven citizen who shook me by the hand and addressed me casually by name as if he had seen me the day before instead of 30 years ago. He was standing at a bench making small cores and told me that had been his job for the past two or three years.

"Naturally I was curious to learn how he had progressed to that stage, but a natural reticence tinged with some of the awe with which I regarded him in my apprentice days prevented me from making any direct inquiries. He relieved me of all embarrassment by taking up the subject himself. I found that he still retained all his old time profane fluency and if some people's ears in that town did not burn for half an hour it was not his fault.

"For several years after I had left the old shop he had remained in charge and apparently enjoyed the full confidence of the owner. He cited an instance to prove this point. At one time the molders had risen in revolt against what they claimed were his arbitrary methods. They went in a body to the owner and delivered an ultimatum that unless the gaffer was discharged they would quit.

The owner loyally backed him up and told them to go. A new crew was hired and things went along peaceably for some time. Then a lack of technical knowledge on the part of the owner precipitated a row and my friend found himself out of a job.

"In this little old fashioned jobbing shop long orders were the exception rather than the rule. Cores for pipes were made in half coreboxes and the halves were pasted. The method was satisfactory and the men were accustomed to it. On this occasion to which I refer the firm received an order for a hundred lengths of 6-inch pipe flanged at both ends. Shortly after the job was started a visitor told the owner he was behind the times, all the pipe shops used loam cores. After the fashion of the usual person who hands out gratuitous information he offered no details on the process. Indeed it is doubtful if he was familiar with it. Also after the fashion of those who accept without question the statements of outsiders, the owner decided that if loam cores were used in regular pipe shops there must be a reason.

"He called the gaffer in and told him he wanted loam cores used on the remainder of the order. The old man admitted that loam cores presented many advantages, but he doubted if it would pay to get up the rigging for such a comparatively short order. However, his principal objection was he had no suitable sand for making loam cores and considerable delay would be caused before a carload could be delivered. The job was in a hurry, he was pushing it through in a manner that insured the delivery of the castings on time and he saw no good reason for jeopardizing the success of the contract.

"Through some peculiar mental twist the owner arrived at the opinion that all these objections merely meant that the old man was bent in having his own bull headed way. He was behind the times, he had been a stumbling block on the path of progress. One word led to another in the beautiful manner which words display on occasions of this kind and when the smoke cleared away the gaffer was out of a job and the owner was in the market for a foreman. The owner declared in a loud voice that if the old man could not make loam cores with the sand he had in the shop, he would get a man who could do so. My old friend retaliated with the equipment of the modern expression 'try and get him.'

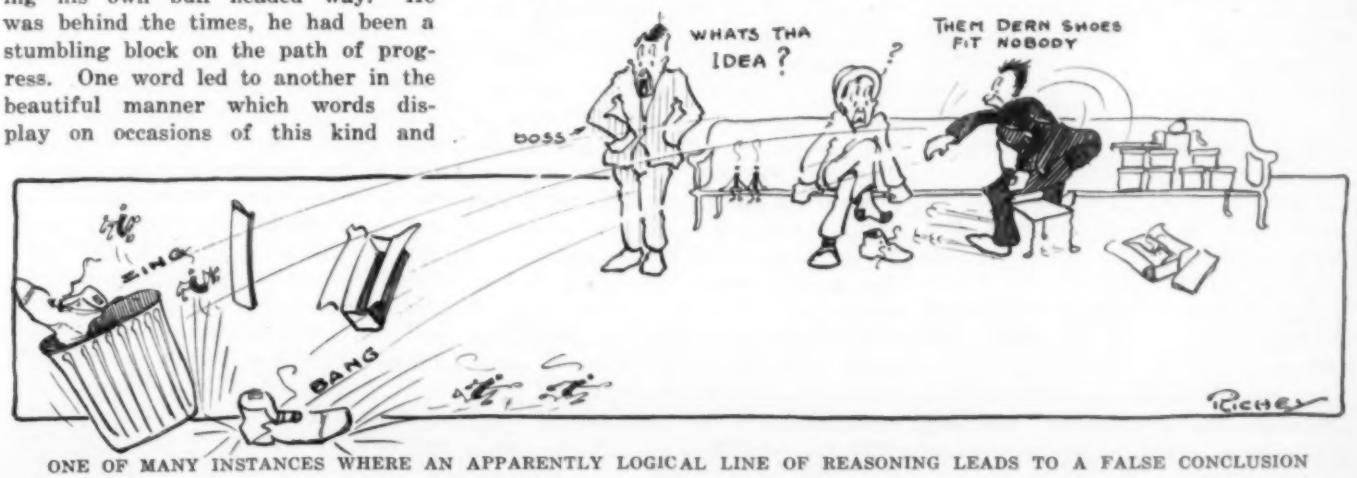
"He got him. An ambitious young lad, long on theory but short on experience who never had made a loam core, accepted the position. He had seen loam cores, but his observation had been confined to the appearance of the cores ready for use. Apparently he never had noticed the barrels in their nude state and was blissfully ignorant of the fact that they are provided with vent holes. Further, he labored under the innocent impression that sand is just sand and therefore if the sand in the shop was suitable for the outside of the mold it should prove equally satisfactory on the inside.

"He ordered a number of lengths of extra heavy 4-inch pipes and wound them with hay rope in the usual manner. Then he mixed a tub of mud, made up of fine molding sand bonded with a couple of shovels of flour and wet down with claywash. The cores looked right slick going into the oven and they looked even better on the following morning after he had given them a coat of blacking. They were as round and smooth and true as so many gun barrels. The owner commended him warmly and probably reflected bitterly that he should have tied a can to the old foreman long before he did.

"Half an hour after pouring commenced he would have given one of his eye teeth if by so doing he could have blotted out the interview which cost him the services of a faithful and competent foreman. The new lad handled the ladle himself and when he noticed the manner in which the iron was coughing in the mold he eased off on the stream with the result that the iron set before the mold was half full. He poured the second mold so fast that the combined pressure of the iron and the gas raised the cope and all the iron poured out through the joint. The third mold furnished the climax. A few extra clamps prevented the cope from lifting, but all the clamps in the shop could not hold the violently boiling mess in the mold. I think the man who invented the saying about hell popping must have received the inspiration in the foundry. The third mold exploded with a force that blew nearly all the sand out of the cope. The air was filled with sand and gobs of molten iron and the shop crew dived like so many mermaids through every door and window.

"The cupola tender threw away his tapping bar and ducked like a rabbit through the little side door leading into his sanctum behind the cupola. When he emerged a few minutes later he discovered to his horror that the iron was up to the tuyeres, the craneman was gone and no ladle was available. He did some private popping on his own account before he tapped the furnace and shut off the wind. The iron struck the ground in front of the cupola and flew in all directions and according to my informant nothing but the grace of God and the presence of mind of the cupola man in dragging out the hose he used for wetting down the bottom prevented the shop from burning down.

"That experience put the official taboo on loam cores. Reluctant respect for a certain statute which depends upon a hangman for its consummation prevented the owner from indulging the dearest wish of his life, but it did not prevent him from instantly and violently separating the new man from the payroll. One of the molders was advanced to the position of fore-



ONE OF MANY INSTANCES WHERE AN APPARENTLY LOGICAL LINE OF REASONING LEADS TO A FALSE CONCLUSION

man and the remainder of the order was made with dry sand cores.

"My old friend secured a foreman's job in another shop in the same town but lost it after a few years through a fluke almost as ridiculous as in the first case. I won't burden you with the details, nor with the particulars of his third venture. He owned a tidy property and did not want to move elsewhere and eventually accepted the job at the core bench where I found him.

"So there y'are" said Bill as he prepared to go. "This man was just plain unlucky. His case is not the same as that of a man whose history I heard the other day. This goof got a job in a shoe store and on the second day the proprietor saw him throw a pair of new shoes in the waste basket. Naturally he asked for an explanation and nearly dropped dead when the lad told him the shoes were no good. He had tried them on half a dozen men and they had not fitted any one of them!"

Contrast Old and New Melting Practice

By Robert E. Masters

ABOUT 36 years ago while on a tour of Great Britain and various countries in continental Europe, I had the privilege of visiting many prominent foundries and had an opportunity to compare their methods and working conditions with those prevailing in the United States at that period. With the exception that the molders bedded a great deal more work in the floor than we were accustomed to on this side of the Atlantic, I found that the general foundry practice was the same. Greater detail was paid to finishing all the molds than was usual in American foundries. The workmen moved at a more leisurely gait and the casting tonnage per man basis was considerably lower. Plumbago was washed or slicked on all molds for important castings and produced a perfectly clean, smooth surface. On light work and on comparatively rough work the plumbago was mixed in the proportion of 1 part plumbago to 4 parts charcoal.

While the methods employed in melting the iron practically were the same on both sides of the Atlantic, the cupolas in which the work was done presented many interesting points of difference. In recent years I believe drop bottom cupolas have been introduced to some extent in British foundries, but at the time of my visit the solid bottom type was employed exclusively. Through personal observation and from information gained through other channels I feel that I am safe in stating that the solid bottom cupola is unknown in America. The only one with which I am familiar stood for many years in Leed's foundry, New Orleans. Recently in checking over a foundry list I find no reference to this old foundry and it may be that both foundry and cupola are among the things that were.

European foundrymen with whom I discussed cupola operation admitted that a drop bottom cupola seemed to present certain advantages, but they claimed the device was not safe and therefore they preferred the solid bottom type. A hearth built on the solid earth was reasonably secure, but they had no faith in a hearth built on a pair of swinging half doors supported on a slender prop in the center.

Dimensions Varied in Old Time Cupola

Cupola	Solid bottom
Lining	4½ inches
Diameter at Melting point	36 inches
Diameter at charging door	45 inches
From bottom to charging door	8 feet 6 inches
Tuyeres	eight
Style	Bolted on outside
Size	3½-inch diameter
Tuyeres above sand bottom	2 feet
Height of slag hole	16 inches
Blower	Roots No. 4
Main blast pipe	12 inches
Two branch pipe	7 inches diameter
Fire started	11 a. m.
First iron charged	2:15 p. m.
Blast on	3 p. m.
First iron	3:20 p. m.
Bottom drawn through front	6 p. m.
Blast pressure	9 ounces
Fuel	coke
Flux	limestone
Iron melted	32,000 pounds
Fuel consumed	8,000 pounds

Present day foundrymen will be interested in the accompanying data copied from the original kindly supplied me by Thomas Lowe, foundry foreman, Fawcett & Preston Co., Liverpool, England on the occasion of my visit Aug. 10, 1889. The entire heat of 16 tons was melted in a little over 2½ hours which seems extraordinary for a 36-inch diameter cupola. The explanation probably lies in the shape of the interior of the cupola. It will be noted that the diameter at the charging door is given at 45 inches and it is natural to assume that this size is continued down to a point immediately above the tuyeres where the lining is constricted to 36 inches. This form of construction is common in British cupolas. The lining is expanded again below the tuyeres to furnish a generous well for the collection of considerable quantities of molten metal. In this particular heat the first casting poured weighed 11,000 pounds. The blast then was stopped intermittently to reduce the melting speed for the remainder of the iron which was carried away in small ladles.

Design of Patterns for Chilled Castings

By Donald A. Hampson

Chilled castings which simply is another term for castings formed either wholly or in part in metal molds, include car wheels, rolls, crusher jaws and other parts subject to severe abrasion strains. Many other forms of castings also are made in metal molds but the object is economy in production instead of the desire to secure a chilled or hardened face on the casting. Interesting examples of this type of casting is presented in the cast iron connecting pieces on metal beds.

Two patterns are required for a chilled wheel, one for the wheel and one for the chill. The pattern is made in all respects as if the wheel is to be molded in sand. The inside face of the chill is turned to a size that will slip easily over the pattern. The chill will contract a sufficient amount during the cooling process to furnish metal for a finishing and truing cut on the face. Since the inside face of the chill determines the diameter of the finished casting it is apparent that it must be machined carefully.

After the metal is poured in a wheel mold the rim cools first and crowds the remaining metal toward the center. Later when the center cools and contracts it shows a tendency to draw away from the rim. Under certain conditions this natural law causes the casting to crack. Various preventive measures are practiced among which of course the most prominent is the almost universal practice of taking the casting while it still is red hot and placing it in a pit with

many others and allowing it to remain there until almost cold. However, some castings crack even before they can be taken from the mold and others crack while cooling.

Sometimes the analysis of the iron is responsible. At other times the trouble may be traced to the design of the pattern. In either case although the remedy is obvious, a certain amount of experimenting usually is carried on by the foundryman, before he finally is convinced what course of action he should pursue. Where a flat web is indicated on the drawing, the patternmaker usually will save time and trouble by making it dished. This form of construction permits a little more stretch than where the web is flat.

Some foundrymen prefer a chill that is a little narrower than the face of the casting. They claim that the margin of unchilled metal prevents the casting from cracking. Approved design for railroad car wheels include rounded corners on the tread and on the flange.

In 1921 the stove and hot air furnace industry was represented by 357 concerns, the decrease to 343 in 1923 being the net result of the loss of 58 concerns which had been included for 1921, and the addition of 44 new concerns.

Discusses Failure of Short Anneal

By H. A. Schwartz

FROM time to time one hears that malleableizing of cast iron can be accomplished in a few days or hours, and that by this method castings can be produced equal in tensile strength and elongation to castings malleableizing for the usual length of time. Thus far no proof has been submitted that such short-time malleableizing can be successfully accomplished under operating conditions.

The conversion of hard iron into malleable is accomplished essentially, by a process involving two stages. First, the castings are maintained at a fairly high and constant temperature, approximating 900 degrees Cent. 1652 degrees Fahr. During this stage of the process the cementite of the castings goes into solution, and somewhat more than the equivalent amount of free carbon separates. The reaction begins slowly, soon increases in velocity for a time, and then proceeds more and more slowly, until equilibrium is reached, when the metal consists of free carbon and a saturated solution of carbon, in some form, in equilibrium therewith.

It is well known that the higher the temperature, the more rapidly is carbon deposited, the sooner is equilibrium reached, and the more carbon is left in solution. The metal is then cooled to below its A_1 point, at about 760 degrees Cent. 1400 degrees Fahr. As the temperature falls, the solubility of carbon decreases, and cooling cannot be carried on faster than at a rate permitting this excess carbon to separate. At A_1 the solubility suddenly falls to zero, and consequently a certain definite time must be permitted, at a temperature somewhat below A_1, to let the last one-half per cent or so of carbon crystallize. Graphitizing rates have been studied accurately by many observers, and the effect of temperature and of silicon content in accelerating the reaction is well known.

It is known equally as well that there are limits to both temperature and silicon content which, when exceeded, seriously interfere with the quality of the resulting product. The practice of most manufacturers is to take advantage of both these factors, as far as is consistent with safety.

It is quite true that such metal can be passed through a heat treatment calculated to produce complete graphitization in about forty hours by working on small pieces and using a dangerously high maximum. However, the problem is different when working on a commercial scale. Few furnaces will heat all parts of their charge to full temperature as rapidly as in forty-eight hours, due entirely to problems of thermal conductivity and also few furnaces are uniform in maximum temperature at all points within, say, 50 to 100 degrees Cent. 90 to 180 degrees Fahr. Therefore, it follows that in practice, the heat-treatment time must be adapted to a temperature, say, 100 degrees Cent., 180 degrees Fahr. lower than the highest it is safe to apply. The effect of this is a large time increase.

The cooling of a heavy charge as rapidly as one might wish from A_1 to room temperature also presents considerable practical difficulty. In addition, at all stages of the heat treatment a sufficient safety factor for unexpected variations in operating conditions must be provided. Any attempt to work on small lots of castings to obviate these thermal difficulties would cost more than could be saved by the decreased time.

The limitations on annealing rate will be seen to be largely of engineering rather than metallurgical character. The use of the continuous furnace has improved matters to some extent, although the effects due to heat capacity and diffusibility of the large masses of pots and castings remain to a considerable degree. There seems to be relatively little prospect of further improvement in the metallurgy of the process. About 75 of the 92 possible elements have been studied with relation to their effect on graphitizing rate. A limited number hold out promise of utility in this direction. It is unlikely that any new and ingenious thermal cycles will alter the minimum time now required for the process as a whole.

A few processes that involve the casting of high-silicon alloys in chill molds *to decrease primary graphitization* and subsequent heat treatment to complete the reaction rapidly *because of the high silicon content* have been suggested and practiced in another connection. However, such material possesses few, if any, of the properties valued in malleable castings.

The author has had a somewhat intimate connection with the problem for twenty years, and can see nothing in the present state of metallurgical knowledge to warrant a hope for a large-scale commercial production of high-grade malleable castings in much shorter annealing times than at present. Fully ten years ago he was personally conversant with an emergency practice of turning out commercially, malleable on an 84-hour cycle on the principles now advocated for reductions in this time. The quality of the product was too erratic to justify the continuance of the practice.

James A. Carey, formerly in business with the James A. Carey Co., has accepted a position in the sales department of the S. Obermayer Co., Pittsburgh. Mr. Carey will represent the latter company in Ohio.

Presented at a meeting of the Hartford Section of the American Society of Mechanical Engineers, Hartford, Conn.

Patternmaker Relies Greatly on *DOVETAIL JOINTS*

By Walter C. Ewalt

MANY of the joints employed by the woodworker and the patternmaker are described in articles which appeared in the July 1 and Aug. 1 issues of THE FOUNDRY. In this article this phase of woodworking is developed further.

Dovetail joints, in their different forms of construction, are thought to to be best adapted for many uses. This type is considered more difficult to make neatly, thus requiring more skill. An example of the use of dovetail joints is found in a pattern for a tuyere, where it is desired that the upper part of the casting be made separately from the lower part, as the upper part is destroyed in the cupola, the lower part remaining in fairly good condition. The two patterns are shown in Figs. 1 and 2. The greatest problem is in making the two end pieces *A* sufficiently stiff and strong to stand the ramming of the sand and at the same time remain square with the bottom board. This is accomplished by making dovetails at the joint as shown. This type of a dovetail is called a through dovetail and is made according to the widths of the boards and with one or more tenons and mortises. In making the dovetail, lines are scribed from the end of each board the thickness of the boards used, thus locating the tenons and mortises where they join, as shown in Fig. 3. If a neat appearing as well as a strong joint is desired, the lines across the width of the boards are divided into equal spaces and the angles are made alike, the angle being in the neighborhood of 75 degrees. Many workmen have a good sense of proportion and simply guess the dimensions and the angle.

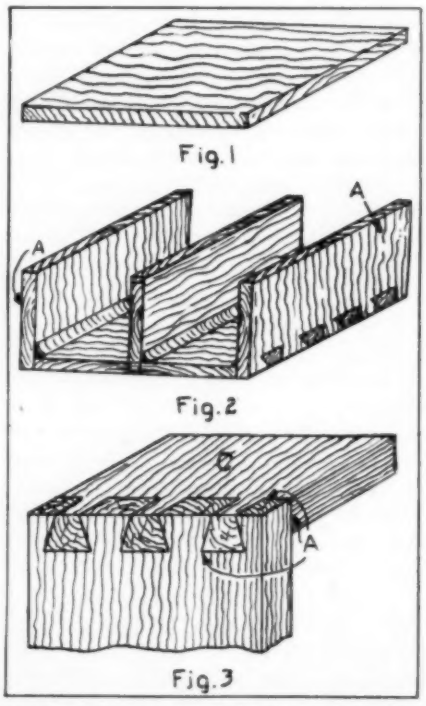
The board marked *B*, Fig. 4, first is worked out, as this piece contains the mortises. Care must be taken to see that the sides or cheeks and the shoulders of the mortises are square with the face. The dovetail saw and chisel are used in removing the wood. When completed, *B* is laid on *C* and fastened in the vise. Lines then are scribed along the dovetails and on the piece *C*. Fig. 5 shows a lap dovetail. This often is used when it is desired not to show the dovetail as in tool box drawer fronts. It will be noticed that the tenons extend only part of the distance into the board *A*.

Fig. 6 shows another lap dovetail joint which does not show either the tenons or mortises, being a blind dovetail. The advantage of this joint is that the edges may be rounded and both the face and side may be shown without showing the method of joining the two pieces. The blind dovetail is shown in Fig. 7. This may be called the acme of all joints, it being a combination of the dovetail and miter joints. The dovetail portion is about one-half the thickness of the wood and the remaining outside part is a miter. A considerable degree of skill is required to make this joint and it is necessary to lay out all the lines carefully.

Laying Out the Joint

The method of laying out the lines may be determined in the illustration rather than by a lengthy explanation. A key dovetail which keeps the boards straight and leaves the dovetail key flush with the surface is shown in Fig. 8. The keys never should be glued to the board, but should remain loose allowing the board to shrink or expand at will.

Sector joints as shown in Fig. 9 are used at times to make large ring patterns. The grain of the wood, running from the outside to the center of the ring, is built up with three or more courses, the joints being broken. This is not as substantial a way to build up a pattern as by segments.



FIGS. 1, 2 AND 3—DOVETAIL JOINTS USED IN PATTERNS FOR TUYERES

Several examples of lagging joints are shown. In Fig. 10 a sample of straight work is shown. The foundation on which the lagging is laid usually is made of several polygonal pieces as shown in Fig. 11, *A*, or semicircular pieces as at *B* for supports, the pieces being connected to a center board or bar. This will be described further in a later article as many patterns are built up in this manner.

Fig. 12 shows the usual way of jointing arms for gears, sprockets, wheels, face plates, etc. Another method of constructing the arms for jobs such as mentioned for Fig. 12 is shown in Fig. 13. In making the joint shown in Fig. 13 the fit should not be as close as in other joints, since the glue will be difficult to force out and consequently the arms will not be in the same plane. Unless the wood is thick, the arms will bend at the joints. In Fig. 12, the wood for each arm should be wide enough to form the fillets at the corners of the hub and also at the rim. The arms also should be long so that they extend into the rim where they may be glued and fastened securely. The joints at the hub sometimes are made with splines, as previously described, but if the hub boss is large enough in diameter, this usually is not done. The joints are butted together, glued and the arms screwed to the drag hub boss.

In making the joint shown in Fig. 13 three pieces equal to the inside diameter of the rim plus the distance which they are to be built into the rim, are planed to equal thicknesses and width. The exact center between the ends is found and square lines scribed across the widths on the face of *A* and *B*, the line continuing around on the back of *C*. The center of the face and back on the center lines then is found. The thickness of the arms is divided into three equal spaces. From the centers found on the face and back, a circle is drawn, the diameter of which is equal to the widths of the arms. After setting the bevel to 60 degrees, lines

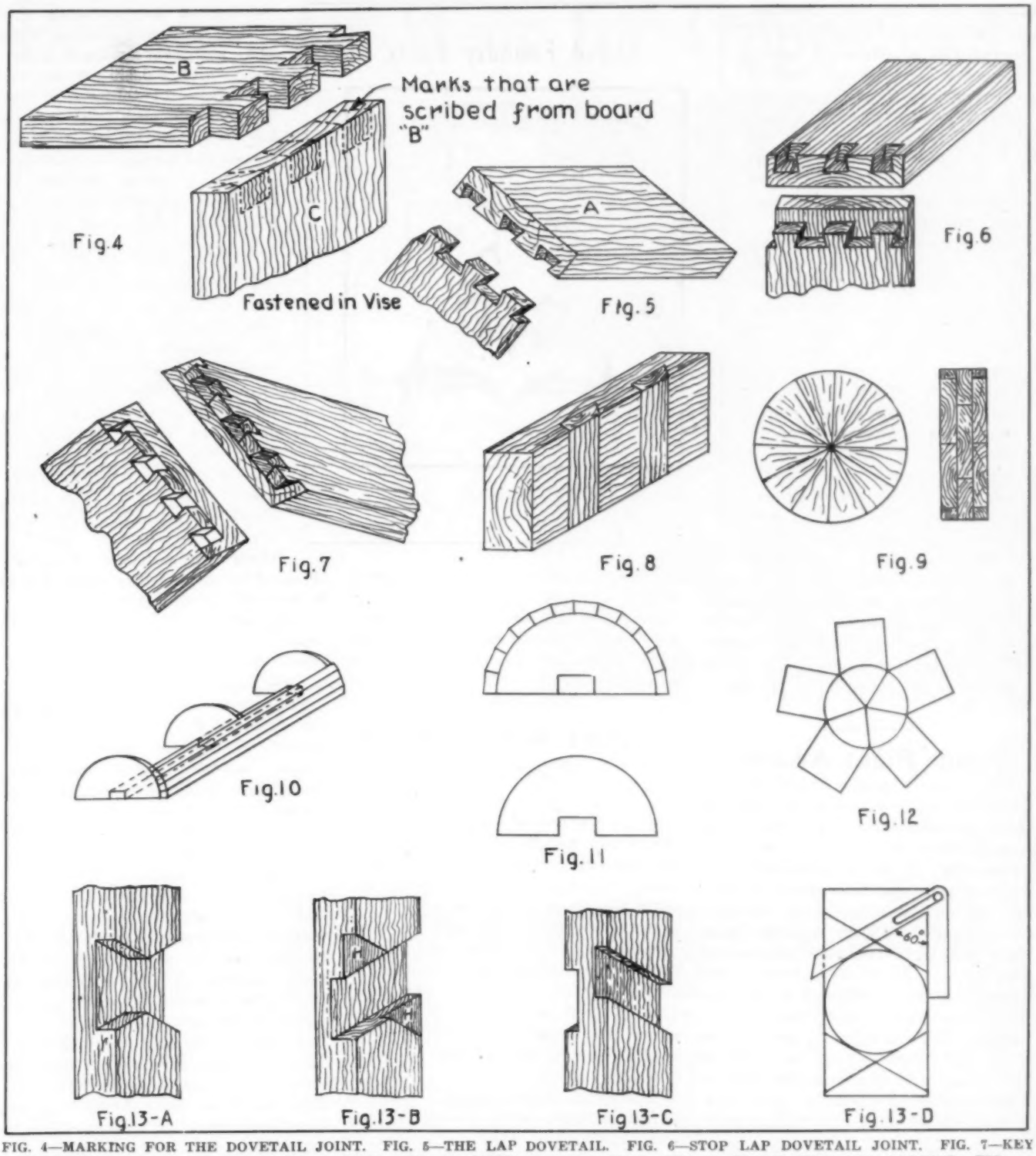


FIG. 4—MARKING FOR THE DOVETAIL JOINT. FIG. 5—THE LAP DOVETAIL. FIG. 6—STOP LAP DOVETAIL JOINT. FIG. 7—KEY DOVETAIL JOINT. FIG. 9—SECTOR JOINTS. FIG. 10—METHOD OF LAGGING. FIG. 11—FOUNDATION FOR LAGGING. FIG. 12—FIVE ARM PULLEY JOINTS. FIG. 13—SIX ARM PULLEY JOINTS

are scribed tangent to the circles. These operations are shown in Fig. 13, *D*. Then the cut is made as shown in Fig. 13, *A*, two-thirds being cut as shown, leaving one-third of wood. The cut is made at *B*, similar to *A*, except that portion marked *H* is cut away only one-third of the thickness. At *C* the angle of the lines on the face are scribed in one direction and in the opposite direction on the back. The wood is recessed on each side to one-third the thickness of the board.

Low Phosphorus Content Wanted in Casting

Question: We shall appreciate your suggestion for a semisteel mixture to meet the following analysis: Silicon 3.02 per cent, phosphorus 0.12 per cent, manganese 0.38 per cent, sulphur 0.10 per cent, total carbon 3.28 per cent. Kindly advice relative weight of coke and iron charges and any other features of interest in connection with melting the material in a 30-inch cupola.

Answer: To secure the low phosphorus, 0.12 per cent, indicated in your inquiry you will have to use practically all malleable pig iron, malleable scrap and steel in your mixture. You may have to add some ferromanganese. The carbon and sulphur contents will adjust themselves. You can raise the silicon content by the addition of ferrosilicon in the cupola. The iron will have to be

melted very hot and therefore you will require a high bed, a liberal coke to iron ratio and a mild blast. The latter feature is a necessary factor in preventing oxidation. From the fact that your specifications calls for a 3.02 silicon we assume that the proposed castings are light in section and that you do not anticipate using more than 10 or 15 per cent steel in the mixture. A typical cupola charge would be made up of 50 per cent pig iron, 40 per cent scrap and 10 per cent steel scrap, with sufficient ferrosilicon to raise the silicon content to approximately 3.30 per cent in the cupola. On a 700-pound charge this will be represented by 350 pounds pig iron, 280 pounds scrap, 70 pounds steel and 10 pounds 80 per cent ferrosilicon. The foregoing is only a brief outline in a general way. Considerable experience and thorough familiarity with the operation of a cupola are required to make satisfactory semisteel. For further and more complete detail we suggest you get in touch with specialists whose advertisements appear in THE FOUNDRY.

Faked Foundry Facts

A Traveler

Builds Plant Addition

The Eagan Johnson Steel & Iron Co. is the name under which the business formerly known as the Eagan Rogers Steel & Iron Co., at Crum Lynne, Pa., is being conducted. The business was organized about 14 years ago by D. C. Eagan and the late John Rogers to fill the need for small steel castings. The new member of the firm is Allen A. Johnson, formerly of Isaac G. Johnson & Co., who joined Mr. Eagan after the Johnson property at Spuyten Duyvil, New York, was taken over by the state of New York for improvements to the Harlem river ship canal.

Construction work now being completed more than doubles the floor space of the Eagan Johnson Steel & Iron Co., and increases the capacity to 600 tons of steel castings per month. These castings weigh from a few ounces to 6000 pounds each. The company specializes in difficult castings such as are used on motor trucks, also on specification work and high pressure work for valves and boiler fittings, as well as machinery parts of all kinds.

The foundry has been extended 60 feet on each end, making the total dimensions 90 x 320 feet. A large new cleaning and shipping building has been completed. New equipment installed includes 12 new molding machines, two 7½-ton overhead traveling cranes, additional grinding and sand blasting equipment and new core ovens.

Desires Semimalleable Cast Iron

Question: We are using a cupola and an acid-lined electric furnace. We would like to produce a sort of semimalleable metal for light castings. A metal that after being cast could be annealed a short time to toughen it. Can you give us some information as to what the silicon, manganese, sulphur and phosphorus content should be, and at what temperature and length of time castings should be annealed? The castings range from ¼ to ½ inch in thickness.

Answer: Semimalleable iron is rather a vague term, and we do not understand quite what you mean. To produce cast iron that is malleable in any sense of the word requires time and careful operation.

Cupola malleable iron should have an analysis of approximately 0.75 to 1.00 per cent silicon, sulphur under 0.10 but may run as high as 0.20, phosphorus from 0.15 to 0.225 per cent, manganese 0.30 to 0.40 per cent as cast.

The charge may consist of 55 per cent pig iron, 30 per cent hard iron scrap and 15 per cent steel scrap. On the start you will have to use all pig probably, and the analysis of the pig should run approximately 1.00 to 1.50 per cent silicon, under 0.05 per cent sulphur, phosphorus 0.15 to 0.225 per cent and manganese 0.4 to 0.6 per cent. The sulphur should be kept as low as possible because it increases the tendency of the white castings to check and also reduces the strength and ease of annealing. Manganese over 0.6 per cent makes castings hard to machine and difficult to anneal. Phosphorus over 0.225 per cent reduces the two most valuable properties of malleable iron, the resiliency and resistance to shocks besides making the metal hard, difficult to machine and liable to checking. The iron should be melted rapidly and hot, hence the tuyeres must be set low and not too high a blast used. The bed in the cupola should be from 20 to 30 inches above the tuyeres, and all charges including the first must be equal in weight. The ratio of coke to iron will be from 1 to 5 up to 1 to 7, not including the bed. Try the lower ratio first. A mixing ladle should be placed beneath the spout and the hand ladles filled from it.

The cupola should be slagged using from 1 to 3 per cent of the weight of iron in limestone. Cores should be well vented and easily crushed to avoid stresses when the castings cool. Large gates and sprues should be employed and the iron poured with slight delay.

Anneal the castings at a temperature from 1500 to 1600 degrees Fahr. as it takes a higher temperature to anneal cupola malleable. Pack the castings in iron oxide or iron scale allowing at least one inch between the side of the box and the casting—put the smallest castings in the center. It will take about 72 hours for the furnace to reach the annealing temperature and the castings should be held at this temperature from 60 to 72 hours. The castings should be slowly cooled for the first 48 hours.

In case your iron comes down cold in the cupola you might use the electric furnace to superheat to a good casting temperature. If the furnace was basic lined it could be used to a decided advantage in removing sulphur with a carbide slag.

The Vulcan Mold & Iron Co., Latrobe, Pa., recently purchased the Peerless Foundry Co., and is installing an electric furnace made by the Pittsburgh Electric Furnace Corp., Pittsburgh, to make electric cast iron.

He Did Not Wait for Opportunity

NOTE the look of concentration on the comparatively youthful features of the gentleman whose photographic representation is shown slightly to the right. Without any inside information you would be justified in assuming that the man was about 50, prominent in one of the learned professions and engaged for the moment in looking over some more or less interesting literature from the Country club.

You would be all wrong and out of order on every count. Fred L. Maytag, chairman of the board of the Maytag Co., Newton, Iowa, is almost 70. He is prominent, but not as a member of one of the learned professions. He is a graduate of a university that has neither study halls nor teaching faculty, a university which he entered in youth and one whose course of study he has not yet exhausted. Incidentally it may be pertinent to point out that he had 22 months actual schooling in the ordinary sense of the term before he was 14 years old. Finally while we have no direct proof to support our supposition we are prepared to lay long odds that the paper in his hands never saw the Country club, but has some direct connection with the washing machine industry.

He was not always a washing machine man. In fact given a different set of circumstances he might become the world's largest manufacturer of pianos, pumps or pulleys. It is conceivable he might have built bridges, boot jacks or bird cages. Happy in the possession of a powerful frame and boundless energy he never found a job too hot or too heavy and has enjoyed every minute of the campaign required to seat him firmly on the throne as the king pin of all washing machine men, past, present and possibly to come.

He was born July 14, 1857, on a farm in Cook county, Ill., but 9 years later the family moved to the broad prairie lands of Iowa and settled on a farm in Marshall county. Here Fred grew up among all the advantages of romantic pioneering life where he was allowed to work like a slave for 22 hours a day and then spend the remainder of his time in any riotous manner his fancy dictated. Instances are on record of men who seem to enjoy this kind of existence. Fred did not. He did not object to the long hours or the hard work, but he did object to the monotony, to the dreary grind and the seemingly aimless existence bounded by a few meals a day and a suit of homespun clothes once every two years.

Even at that time the spirit of the trader was stirring within him and he needed no university course to tell him that about the worst possible place a potential trader could pick to exercise his art was an Iowa farm about the middle of the past century. Trading even on the most limited scale is based on the more or less mutual desire of at least two people and when a man has to travel half a day to find a second person, the possibility of dying a merchant prince is decidedly flimsy. He turned the situation over in his mind many times and viewed it from many angles and then being 23 years of age and a man full grown he decided to quit the farm and push his fortune in a more populous community. The nearest community was Newton at that time with a population of 1500. Here Fred settled down and found such opportunity for profitably turning over his talents that he has remained there ever since. Among the inside circle of the older inhabitants it is currently

reported that he has made some money and even if he lost his present job he is in no danger of becoming a charge on the county.

The future employer of many men accepted an humble position in an agricultural implement store where he worked so diligently and saved his money so consistently that at the end of two years he was able to lay down $800 and purchase a half interest in the firm. Several years later he saw the opportunity for which he had been waiting and with three other Newton business men he started the first manufacturing plant in the town with a capital of $2400.

In 1911 the company started to manufacture washing machines and the measure of success which followed the self-feeder is not one, two, three with that which has characterized the sale and distribution of the washing machine. The statement modestly has been advanced that while the retail sales last year amounted to $18,000,000, the sales so far this year presage a volume of $30,000,000.

In addition to the active—quite active—supervision of this tidy little business Mr. Maytag has found time to serve 10 years on his home town council board and to fill the office of mayor for two terms. Also he has served as a member of the Iowa state legislature for five terms, being chairman of the committee on appropriations for the last three.

Big, breezy, buoyant, full of optimism with business contacts all over the United States he has traveled a long way from the farm and the little village store, but he still maintains a sympathetic contact with both of these humble sources. He can nip a chew from a plug of tobacco as neatly and blithely and enjoy it fully as well as he could in the days before he was 21 and a chew was an event of major importance.

The Shakeout

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CHARLES VICKERS, Nonferrous Editor
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¶ Do Not Stand and Wait for It

WITH a few notable exceptions, foundrymen are at the tail end of the industrial procession in soliciting business, while the idea of investing any capital in an experimental line never is considered under any circumstances. The majority of foundrymen—at least tacitly—say in effect: Well, here I am ready to make castings; ready to execute any order left by a customer. Any customers who need castings know I am here. When they are ready to place an order they will notify me.

THAT line of reasoning was quite logical when establishments were few and small and when each shop only served a limited community. Times and conditions have changed to keep pace with the increase in population and the increase in the needs of these same people. In these modern days the only way to get business either in the foundry or in any other line is to go out and get it. Before starting out, the prudent foundryman will fortify himself with arguments that will appeal to a customer who is free to choose between many purveyors of castings. It may be price, weight, terms, delivery date or quality, but his total number of appeal points must be greater than those presented by his rivals. The art of selling castings in these modern days exceeds the skill required to make them.

CONDITIONS similar to those which obtained during the late war, rise occasionally when all manufacturing plants are pushed to and beyond capacity, but in normal times the opposite is the case with not enough business to go around. The owner of each plant must depend on his own effort and ingenuity. In fact the extent to which the order book is filled is a fair criterion of his ability to compete with his business rivals.

¶ Common Labor Dwindles

ACCORDING to a recent report of the National Industrial Conference board, the total number of common laborers admitted to the United States in the first 10 months since the 2 per cent quota was established is less than the number which returned abroad. The total of this class of immigrants admitted from July, 1924 to April, 1925 was 27,908, against 97,886 during the same period of the previous years. During the ten months period first mentioned, 44,750 laborers left the country, leaving an actual deficit of 16,842.

DOUBTLESS these figures are significant. They mean much to some industries and doubtless will have an indirect effect upon the foundry industry. However, under the existing business conditions, an ample supply of common labor is at hand. Many state that a marked increase in business would uncover a shortage of skilled molders, and this fact is of greater significance. The great swing toward mechanical aids to foundry production came none too soon, and the answer in event of any growing labor shortage will be found in the greater use of machines.

¶ Can't Keep Them Down

PERIODICALLY, something is encountered which is taken by the consuming public to indicate the decline of castings below the industrial horizon. When steel railway cars first were constructed on a production basis, about 1900, malleable castings were indicted. Builders refused to specify malleables for underframes, stating, and perhaps with a great degree of truth, that the quality was so uncertain that no reasonable factor of safety could be applied.

THIS doubt was quickly and definitely removed by action of the malleable castings manufacturers themselves. An organization was formed which through study and experiment improved the quality of malleable castings, and further, adopted rigid requirements which were enforced upon all members. As a result malleable castings became a dependable product with known qualities upon which a designing engineer could build his structure. From that time forward the use of malleable castings increased in railway service.

RECENTLY the pressed steel truck frame has been favored by many railway engineers. Many predicted the entire replacement of cast steel truck frames by the structural material. Similarly pressed parts were brought forward to replace small castings, as in the case of axle box covers. In both instances the pendulum of engineering preferment seems to be swinging again to castings. The pressed steel truck frames are criticized on account of giving insufficient metal in some sections where great strength is required. The pressed steel axle box covers are found to be less corrosion resistant, than the malleable castings, particularly under the rigors of brine or chemical dripping from refrigerator or tank cars.

Trade Outlook in the Foundry Industry

CONDITIONS remain practically unchanged in the foundry industry. With the exception that steel and malleable foundries catering principally to the railroads are operating at the lowest point recorded for a considerable period. Here and there jobbing shops report capacity business, but the majority are carrying on with reduced staffs and an output of between 60 and 70 per cent of their potential capacity. Radiator and most of the automobile foundries are extremely busy and several pipe foundries are contemplating additions on the strength of present demand as translated into future possibility.

Freight Increased

Recession in iron and steel apparently has reached the limit of the ebb. Restrained railroad buying has been one of the weakest links in the iron and steel consumption chain during the past year. Despite enormous freight movements, railroads purchased only 25,000 cars in the first half of 1925, compared with 74,000 in the corresponding period in 1924. Present indications point to increased buying in the second half of this year. Curtailed buying does not indicate curtailed activity on the part of the railroads, it simply means deferred buying. According to a report of the American Railroad association loading of revenue producing freight cars for the week ended July 18 totaled 1,010,970. This marks the first time this year that the million mark has been reached. Report of the same association shows a continual falling off in the number of surplus cars. When the flood of repair and replacement castings order is released it will be heavy. In a comparative summary for 130 identical malleable iron plants prepared by the department of commerce, June operations are shown to have dropped to 51.6 per cent of capacity.

Prices for Raw Materials for Foundry Use

CORRECTED TO AUGUST 6

Iron		Scrap	
No. 2 foundry, Valley	$18.50	Heavy melting steel, Valley	$18.00 to 18.50
No. 2 southern, Birmingham	17.50 to 18.50	Heavy melting steel, Pitts.	18.50 to 19.00
No. 2 foundry, Chicago	20.50	Heavy melting steel, Chicago	15.75 to 16.25
No. 2 foundry, Philadelphia	20.76 to 21.26	Stove plate, Chicago	16.25 to 16.75
No. 2 foundry, Buffalo	18.25 to 19.00	No. 1 cast, Chicago	20.25 to 20.75
Basic, Valley	18.00	No. 1 cast, Philadelphia	17.50 to 18.25
Basic, Buffalo	18.50 to 19.00	No. 1 cast, Birmingham	16.00 to 16.50
Malleable, Chicago	20.50	No. 1 cast, Buffalo	16.00 to 16.50
Malleable, Buffalo	18.50 to 19.00	Car wheels, iron, Pittsburgh	17.00 to 17.50
Coke		Car wheels, iron, Chicago	17.50 to 18.00
Connellsville foundry, coke	$3.75 to 4.25	Railroad malleable, Chicago	18.50 to 19.00
Wise County foundry, coke	4.50 to 5.25	Agricultural, mal., Chicago	16.50 to 17.00
		Malleable, Buffalo	17.50 to 18.00

Bath Tubs in Demand

Price decline has been checked and the iron and steel industry now is in a period of firmness and an upward trend is becoming noticeable. Among the factors which presage a continuation of this condition are: The number of new business enterprises, indicating growing optimism; interest rates still sufficiently easy to encourage business development; favorable political situation with assured tax reduction, the effect of which will be investment of additional capital; building operation remarkably well sustained; general trend upward of commodity prices; largest summer production of automobiles and trucks in the history of the industry. Unprecedented building construction is reflected in the orders for enameled sanitary ware as reported by the department of commerce. June orders for bath tubs amounted to 133,976 compared with 121,659 for May. Orders for lavatories, sinks and miscellaneous ware increased in about the same proportion. The June shipment of bath tubs is the largest in the history of any month for three years.

Pig Iron Stiffening

Blast furnace pig iron production for July according to statistics compiled by the *Iron Trade Review* totaled 2,664,953 tons compared with 2,679,045 tons for June, giving a loss of 0.52 per cent. On a daily average basis, the July rate was 85,966 tons per day, compared with 89,301 tons per day for the preceding month and on this basis the daily loss was 3335 tons or 3.7 per cent. Merchant pig iron made in July totaled 608,896 tons and registered a gain of 45,114 tons over the 563,782 tons produced in June. On an average daily basis this represented 19,642 tons per day, which compared with the 18,792-ton rate of the month before was an increase of 850 tons per day. Steelworks or nonmerchant iron produced for July amounted to 2,056,057 tons and showed a loss of 59,206 tons from the 2,115,263 tons made in the preceding month. Reduced to the daily basis, this represented 66,324 tons in July against 70,509 tons per day in June. On the last day of July, 188 blast furnaces were operating, this being a loss of three from the 191 producing iron on June 30. During the month 3 merchant furnaces were blown in and 3 were blown out or banked. Of the nonmerchant class 3 were blown in and 6 were blown out, the net loss being 3 stacks. The iron and steel industry is turning the corner with firmer prices and indications of better buying. The railroads made a better showing in June earnings than generally was expected and their financial outlook for the next few months has brightened materially.

Nonferrous Operations

Brass foundries are fairly active. Nonferrous prices according to New York quotations in the *Daily Metal Trade* of Aug. 6, follow: Casting copper 14c; electrolytic copper, 14.62½c; Straits tin, 59.25c; lead 8.50c; antimony 18.00c; nickel 38.00c; No. 12 alloy remelt aluminum 23.00c; zinc is 7.50 to 7.60c, East St. Louis, Ill. Average monthly prices for July follow:

New York Prices

Castings Copper	Electrolytic Copper	Lead	Tin Straits	Antimony	Aluminum 98-99	Zinc St. Louis
13.563	14.197	8.091	58.076	17.576	27.00	7.215

Comings and Goings of Foundrymen

R. M. SCOTT has been appointed foundry manager of the Packard Motor Car Co., Detroit, succeeding Fred Erb, who recently resigned. Mr. Scott was born in Walkerville, Ont., Canada, Dec. 18, 1885. He moved to Cleveland at an early age where he attended the public school and served his apprenticeship as a patternmaker at the Cleveland Punch & Shear Works. After two years spent in various shops, he

R. M. SCOTT

became connected with the Packard company in June, 1907. From that time until 1912 he worked at the bench as a patternmaker, being appointed assistant foreman in the latter year. In 1913 he was made general foreman, in 1920 assistant foundry superintendent, in 1920 foundry superintendent and in July, 1925 foundry manager, having charge of the making of all patterns, brass, aluminum and gray iron castings. Mr. Scott comes from a family of foundrymen, his father having built the experimental patterns and supervised the making of castings for the first car made by the Packard company, and his two brothers also being connected with the trade. Mr. Scott is secretary of the Detroit Foundrymen's association, having held this office for two years.

Mathew E. Johnson has resigned as foundry instructor at the William Hood Dunwoody Industrial institute, Minneapolis, Minn., and has moved to West Allis, Wis.

C. E. Boyd has been made works manager of the Newman Foundry Co., Kendallville, Ind. Mr. Boyd formerly was sales representative for the E. J. Woodison Co., Detroit.

James W. Gorman has been made general foundry foreman of the Dennison Alloy Steel Casting Co., Dennison, O., instead of James W. Grossman, as stated in the Aug. 1 issue.

M. L. Frey, formerly assistant research metallurgist Holt Tractor Co., Peoria, Ill., has been made chief metallurgist and research engineer for the Gerlinger Electric Steel Casting Co., West Allis, Wis.

Julius B. Koehler, just elected president and general manager of the Monitor Furnace Co., Cincinnati, had been vice president of the company. S. C. Bernhardt, new member of the board, is vice president and sales manager.

E. W. Arndt, formerly connected with the Duncan Foundry & Machine Works, Alton, Ill., has been made superintendent of the foundry department of the Joshua Hendy Iron Works, Sunnyvale, Calif. Mr. Arndt will supervise improvements in the foundry.

Achille Daugenet, proprietor, and Maurice Leroyer, metallurgist, Fonderie des Ardennes, Mezieres, France, spent 15 days in America during the month of July inspecting powdered fuel installations for possible adaptation to the company's requirements in its plans for making American malleable iron.

C. W. Mills has resigned as superintendent of Hoosier Stove Co., Marion, Ind. to become superintendent of the Star Furnace & Foundry Co., Evansville, Ind. Mr. Mills spent 11 years working as a molder in various parts of the country, was in charge of the core room of the Globe Stove & Range Co., Kokomo, Ind., for three years and was connected with the Hoosier Stove Co. for seven years.

J. P. Johnston has been made foundry superintendent of the Wilmerding shops of the Westinghouse Air Brake Co. Mr. Johnston began his foundry career as a molder in the Allegheny foundries of the Air Brake works 38 years ago. In 1909 he was made assistant foreman, remaining in this position until May, 1924, when he was made general foreman. In November, 1924 he was made acting superintendent and recently was appointed superintendent.

Noah F. Young recently was elected president of the Lumen Bearing Co., Buffalo. Mr. Young was born Aug. 29, 1886. He went to work after completing grammar school becoming connected with the Lackawanna Steel Co., now

NOAH F. YOUNG

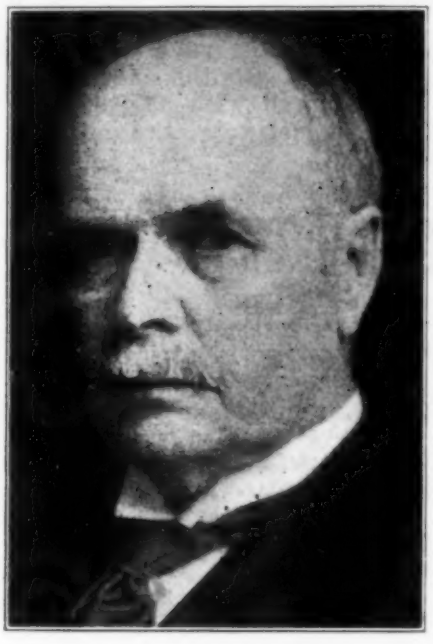
the Bethlehem Steel Corp., Bethlehem, Pa., in the engineering department, later becoming chief clerk in the purchasing department. He left the Lackawanna company in 1906 to become assistant cashier of the Lumen Bearing Co. He later became cashier, assistant treasurer, treasurer, and at the stockholders' meeting last February was made general manager. William H. Barr, president of the company for many years, had resigned and the company had been without a president since that meeting, until the appointment of Mr. Young.

George P. Fisher who has been connected with the Whiting Corp., Harvey Ill., for many years in various capacities including, demonstrator, salesman and foundry superintendent, recently resigned to accept a position as works manager the St. Louis Steel Casting Co., St. Louis. As a demonstrator of foundry melting equipment

Mr. Fisher has had a wide and varied experience in many places including South America where he installed the first steel melting unit in America south of the equator. He has been an active member of the Chicago Foundrymen's club and at the annual meeting Jan. 12 he was elected president for the current year.

William McConway Dies

William McConway, aged 83, president of the McConway & Torley Co., Pittsburgh, steel manufacturer, died in St. Francis hospital, that city, on July 28 following an operation found necessary after four weeks' illness. He was born in Desertmartin, County Derry, Ireland, Feb. 14, 1842, and came to



WILLIAM McCONWAY

this country with his parents in 1849. The family settled in Pittsburgh and the son attended the public schools until he was 12 years old, when he went to work.

Mr. McConway's first employment was with the old Novelty Iron Works, where he remained for a period of six months, leaving to accept a position with Oldhausen & Crawford, manufacturers of malleable iron castings. He remained with this concern until the Civil war, leaving to join the army, but resuming his employment with the firm when hosilities had ceased, becoming a junior partner in the firm in 1866.

In 1869 he organized his present business under the firm name of Lewis & Co., being general manager. In 1870 the name was changed to McConway & Torley Co., and was incorporated in 1882. Mr. McConway was a member of the board of education when it was reorganized and a director of numerous corporations, but in recent years he resigned from a number of them. He was president and director of the McConway & Torley Co. at his death; president of Allegheny Cemetery; a trustee of Carnegie Institute of Technology; a trustee of the Elizabeth Steel Magee hospital, and a director of the Westinghouse Electric & Mfg. Co.

Mr. McConway was a member of the Duquesne club, of which he was president from 1899-1901; Pittsburgh club, Union club, University club, Pittsburgh Athletic association, Engineers' Club of New York, and the Loyal Legion.

Obituary

August Slusser, works manager of the Westinghouse Electric & Mfg. Co., Trafford City, Pa., and prominent in Trafford City affairs, died in his home there Aug. 3. He was born in Louisville, O., Oct. 7, 1875, later moving with his family to Canton, O. When 20 years old he entered the service of the Morgan Engineering Co. at Alliance, O. A year later he joined the Westinghouse company as a foreman in the Pittsburgh works. His career with that company was of continuous progress to the executive office of works manager of the Trafford City foundry. Mr. Slusser was a director of the First National bank of Trafford City, president of the Trafford Oil & Gas Co., and president of the McKeesport-Versailles Gas & Oil Co. He was a member of the first council of Trafford City after it was incorporated in 1903.

John J. Hayes, of J. J. Ryan & Co., brass founders, Chicago, died at his home in Chicago, July 28.

John S. Davies, formerly superintendent of the Cleveland Steel Castings Co., Cleveland, died at his home at 1481 Westwood avenue, Lakewood, O., Aug. 3, aged 63 years.

Start Japanese Company

The Westinghouse Electric Co. of Japan has been organized to distribute products of the Westinghouse company throughout Japan. The officers of the new company, which is a subsidiary of the Westinghouse Electric International Co., are as follows: Guy E. Tripp, chairman; L. A. Osborne, president; E. D. Kilburn, vice president; and I. F. Baker, managing director, located at Tokyo.

English Foundryman Dies

Thomas Henry Firth, chairman of the Brightside Foundry & Engineering Co., Sheffield, Eng., and allied companies, died suddenly at his residence in that city, July 16 at the age of 54 years. He succeeded his father as chairman of the company and was largely responsible for its development into one of the leading foundries of Great Britain. The Brightside company is a large producer of ingot molds, rolls and steel mill equipment and during the past few years has produced some of the largest gray iron castings made in England.

Mr. Firth was an active and influential member of the technical and business organizations devoted to the

THOMAS HENRY FIRTH

foundry industry. He was president of the Institute of British Foundrymen in 1918. In 1922, with Oliver Stubbs, then president of the institute, he visited the United States on an official errand tending to promote better international business relations. At this time he made many warm friends in America, and with Mr. Stubbs cemented personal contacts which were initiated during the official visit of the late A. O. Backert, in 1918 when as president of the American Foundrymen's association, the latter visited various European foundry centers and was the guest of the technical organizations abroad.

The Barnum Machine & Pattern Works, New Haven, Conn., has been moved from 28 Whitney avenue to 679 State street. The company makes wood and metal patterns.

Equipment Market Tone Better

Manufacturers Feel the Remainder of the Year Will Bring Substantial Increases in Business—Exports of Equipment in June Show Marked Decline

AUGUST will record a gain in the volume of foundry equipment sold, if the conditions noted early in the month continue throughout the period. While the resistance to sales efforts has been great during the summer months, and the business closed during June was low, a gain was registered in July over the preceding month, and it generally is conceded that the volume of sales for the summer months will be in excess of that realized during the same period in 1924. The business for the first half of the year was approximately equal to the total for the first six months of the preceding year.

Most manufacturers are doing a satisfactory business, the usual seasonal decline considered, and the feeling prevails that the remainder of the year will witness a gradual improvement in the market. Molding machine sales are fairly active, while the demand for cleaning equipment appears heavy. Several plants report an increased demand for repair and spare parts. One plant making an industrial electric truck applicable to the foundry industry is enjoying a heavy business.

Exports of foundry and molding equipment showed another decrease in June, the value of exports being $49,863 compared with $65,282 in May and $95,705 in April. A decrease also was noted over June, 1924 when the value was $63,-031. The exports for the 12 months ended June 30 was $651,331 as compared with $379,681 for the corresponding period last year, the gain for the year being $270,630.

Sales in Summer Period Hold Up Well

THE foundry equipment market in the Chicago district is spotty, but as a whole reveals improvement over 30 days ago. Through A. A. Wickland & Co., Chicago, the Standard Foundry Co., Racine, Wis., has placed an order for 10 rack type core ovens with the Foundry Equipment Co., Cleveland. The International Harvester Co., Chicago, has placed some molding machines for its Chicago tractor works. Sand mixers have been purchased from the National Engineering Co., Chicago, by the National Malleable & Steel Castings Co. for its Chicago plant, the DeSoto Foundry, Mansfield, La., and the Detroit Lubricator Co., Detroit. A Chicago manufacturer of conveying systems reports the best inquiry in several months. July was a big month for a manufacturer of molding machines. The Atlas Foundry & Machine Co., Tacoma, Wash., the Western Electric Co., Chicago., Dowesett-Rhul Co., Monterey, Calif., and the Cupples Co., St. Louis, Mo., have purchased sand-blast equipment and the Beckwith Co., Dowagiac, Mich., has secured dust arrester from the Pangborn Corp., Hagerstown, Md. The Rundle Mfg. Co., Milwaukee, has ordered shakeout bails and the Studebaker Corp., South Bend, Ind., has closed on vibrators and shakeout equipment from the Stoney Foundry Engineering & Equipment Co., Cleveland. Sand-blast equipment has been sold to a large steel foundry in St. Louis by the W. W. Sly Mfg. Co., Cleveland. That company also has sold a tumbling mill to the Southern Manganese Steel Co., St. Louis, two tumbling mills to the Chicago Hardware Co., Elkhart, Ind., and dust arrester equipment to the Waterloo Gas Engine Co., Waterloo, Ia.

Eastern Demand Slow

A SLIGHT improvement is reflected in the demand for foundry supplies. Demand for equipment continues slow, but better conditions are expected as a result of the improved sentiment which pervades the industry generally. Perhaps the poorest buyers are the stove and boiler founders, whose plants either are idle or are operating at reduced schedules. Other classes of melters are doing somewhat better. Several cupolas have been sold in this territory during the past couple of weeks, principally by the J. W. Paxson Co., Philadelphia, which among other concerns, sold a cupola for the new Boonton, N. J. foundry of the Carteret Foundry Co., Jersey City. Demand for molding machines is slow. Included in recent business are molding machine orders which the American Foundry Equipment Co., New York, booked from the Lineberry Foundry & Machine Co., North Wilkesboro, N. C., and the G. L. Anderson Brass Works, Birmingham. Demand for electric furnaces has developed nothing of interest; several inquiries have come out, but there apparently is no disposition to close. Orders for sand blast installations are of a small and scattered character, but several of the larger companies have given indications that they may be in the market for sand blast apparatus in the next few months. A. Weiskettle & Son Co., Baltimore, has purchased sand-blast and dust arrester equipment and the Old Dominion Iron & Steel Co., Belle Isle, Richmond, Pa., has secured sand-blast equipment from the Pangborn Corp., Hagerstown, Md. The Chrome Steel Works, Chrome, N. J., has ordered a complete sand-blast room installation from the W. W. Sly Mfg. Co., Cleveland. The International Heater Co., Utica, N. Y. has bought a shakeout bail from the Stoney Foundry Engineering & Equipment Co., Cleveland. A number of sand cutters have been sold during the past couple of weeks. It is reported here that the Westinghouse Electric & Mfg. Co. has not yet begun the purchase of equipment for the large new brass foundry it is to erect at Linhart, Pa. The Eagan Johnston Steel & Iron Co., Crum Lynne, Pa., which erected additional buildings, has installed a large amount of new equipment, including molding machines, swing and stand grinders and other units. Demand for pneumatic equipment for foundries is ex-

ceedingly slow. Foundry equipment makers report a steady flow of inquiries from Europe, Central America and some other foreign countries, particularly for sand blast equipment and electric furnace installations, but practically none of them have resulted in business. The entire foreign business of one important house during the first half of this year was the sale of one tumbling barrel for export to Japan.

Cleveland Outlook Brighter

A HEALTHIER condition seems to exist in the foundry equipment market in the Cleveland territory, many manufacturers fully believing that a gradual improvement in the volume of sales will be the dominating feature of the market during the remainder of the year. In many cases sales in July were heavier than during the month of June, and also better than during the corresponding month in 1924, one company reporting one of the best months in its history. Several plants making castings for automobile companies are reported considering new equipment for use in meeting the 1926 automobile production schedules. Inquiries are keeping up well and repair business in certain lines is picking up. Compared with the summer months in other years, the business closed during this period in 1925 has been satisfactory. The Chisholm & Moore Mfg. Co., Cleveland, has purchased a tumbling mill, the Columbus Malleable Iron Co., Columbus, O., three tumbling mills, the City Foundry Co., Cleveland, a large tumbling mill and a drawer type core oven, and the West Steel Casting Co., Cleveland, a complete sand-blast room installation, from the W. W. Sly Mfg. Co., Cleveland. A large foundry at Dayton, O., has purchased blast mills of the positive pressure type from the same maker. In addition to the recently reported sale of dust arrester equipment for export to Trondhjem, Norway, the W. W. Sly company has sold eight tumbling mills to a French plant of a large American company making heating specialties, and a cinder mill to Ley's Malleable Casting Co., Derby, England. Sand blast equipment has been purchased by the Cadillac Motor Car Co., Detroit, from the Pangborn Corp., Hagerstown, Md. Two shakeout bails have been ordered by Metters, Ltd., Sydney, Australia, and vibrators and shakeout equipment from the Ferro Machine & Foundry Co., Cleveland, the American Radiator Co., Buffalo, the Modern Foundry Co., Cincinnati, and the Dayton Steel Foundry Co., Dayton, O., from the Stoney Foundry Engineering & Equipment Co., Cleveland. The Nickel Plate Foundry Co., Cleveland, has purchased a furnace from the Mayor Fuel Saving & Furnace Co., Cleveland, while the Sterling Foundry Co., Wellington, O., has taken a rolling drawer type core oven from the F. A. Coleman Co., Cleveland.

New England Orders Slow

ALTHOUGH foundries throughout New England are finding orders coming in at an encouraging rate and the total melt in the district is reported on the increase, recent sales of equipment have been few and far between. A Massachusetts foundry bought six molding machines and scattered orders for individual machines brings the total for the past 10 days to 12 or 15. Some improvement in inquiry has developed. A Worcester producer is in the market for an annealing oven. Other inquiries include several small cranes, sand throwing equipment, a crucible furnace and molding machines. The Connecticut Foundry Co., Rocky Hill, Conn., has purchased blast mills of the positive pressure type from the W. W. Sly Mfg. Co., Cleveland, and the Eastern Malleable Iron Co., New Britain, Conn., has secured sand-blast equipment from the Pangborn Corp., Hagerstown, Md.

Pittsburgh Inquiries Steady

MANUFACTURERS and distributors of foundry equipment in the Pittsburgh district find themselves in a good position so far as inquiry is concerned, but are meeting with some difficulty in closing sales. Foundrymen still retain conservative attitudes. Shop equipment is scrutinized carefully and if repairs are not too costly the equipment is made ready for additional service. Not much activity is encountered from shops specializing on automobile engine castings but interest from buyers of this class is expected to be renewed within the next two or three weeks when automobile producers will have gained some knowledge concerning the reception of new models. Makers of equipment are experiencing no hardship in getting orders in transit promptly, and with this condition maintaining, no incentive exists for users to place equipment much before it is needed. Current sales this week include two sand mixers which were shipped by the J. S. McCormick Co., Pittsburgh. Other sales include miscellaneous equipment of a small character. The Superior Bronze & Aluminum Co., Warren, O., purchased some gas and oil furnaces and other equipment for its new 40 x 120-foot foundry. The Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., purchased some miscellaneous equipment for its East Pittsburgh foundry and also is buying various items for its new foundry at Linhart, Pa. The Lycoming Mfg. Co., Williamsport, Pa., has purchased equipment from the Pangborn Corp., Hagerstown, Md., and the Stoney Foundry Engineering & Equipment Co., Cleveland, has sold vibrators and shakeout equipment to the Ajax Iron Works, Corry, Pa., the Richmond Radiator Co., Uniontown, Pa., and the Conemaugh Iron Works, Latrobe, Pa. A contract for a 2-story addition for the Kennedy Valve Mfg. Co., East Water street, Elmira, N. Y., was let to the Lowman Construction Co., and the trade expects the submission of inquiry for miscellaneous brass foundry equipment this month. Specifications on the inquiry for five cranes ranging from 5 to 25-ton capacity, have been revised by the Youngstown Foundry & Machine Co., Youngstown, O. The American Steel Foundries is spending $5000 on a new building for its Smallman street division in this district. No definite information is available whether new equipment is to be purchased. The Allegheny Steel Co., Brackenridge, Pa., recently purchased a 15-ton, 75-foot span crane through Manning, Maxwell & Moore, Pittsburgh. A 3-motor crane of 10-ton capacity and 71-foot, 8-inch span will be built by the Cleveland Crane & Engineering Co., Wickliffe, O., for the Lorain Steel Co., Johnstown, Pa.

Two Furnace Companies Form Combination

The Dempsey Furnace Co., Jersey City, N. J. has been consolidated with the W. N. Best Corp., 11 Broadway, New York, manufacture of industrial oil fired furnaces, oil burners, etc. The combined furnace business of the two companies will be operated as the Dempsey Furnace division of the W. N. Best Corp. and will be under the direction of H. B. Dempsey. The combination of these two companies makes possible the handling of any problem in the oil burning and furnace fields. The scope of their operations covers the designing and building of furnaces for heat treating, nonferrous melting, galvanizing, forging, enameling, and iron and steel furnaces for all purposes. They are also specializing on core ovens, oil burning equipment for ladle heating and mold drying.

What the Foundries Are Doing

Activities of the Gray Iron, Malleable, Steel and Brass Shops

Richmond Hill Foundry Co., 127th street and Ninety-first avenue, Richmond Hill, L. I., N. Y., was damaged by fire recently.

Standard Chilled Castings Co., Foundry turnpike, Lynchburg, Va., will rebuild its plant recently damaged by fire.

Youngstown Foundry & Machine Co., Youngstown, O., will rebuild its foundry recently burned. B. G. Parker is general manager.

Wright Machine Co., Worcester, Mass., will build a foundry 50 x 90 feet for production of brass castings.

Otis Elevator Co., 813 Northland avenue, Buffalo, N. Y., is having plans made for a steel foundry addition to its plant.

M. S. Fisher and associates, Canyon, Texas, have established a plant to manufacture piston rings for automotive engines.

St. Louis Architectural Iron Co., 1970 DeKalb street, St. Louis, has been damaged by fire with moderate loss.

Diversey Foundry Co., Peyton and Richard streets, Geneva, Ill., is constructing a large addition to its foundry and machine building.

Mechanical Pattern Works, Vernon, Calif., is having construction started on a reinforced concrete foundry and shop building at 4545 Pacific boulevard.

A. Weiskittel & Son Co., Baltimore, has awarded contracts to the Baltimore Steel Co. for fabricating the 200 tons of structural steel to be used in a new foundry building.

Following its removal to Winchester, Ky., the Timmins Foundry Co., Lexington, Ky., is expected to increase its capacity. William Timmins, 608 West High street, is president.

Koehring Corp., Milwaukee, builder of concrete mixers, etc., has awarded contracts for an extension to its core room. Herbst & Kuenzli, 130 Grand avenue, are architects.

H. N. Strait Mfg. Co., Adams street and Shawnee avenue, Kansas City, Kans., will rebuild its burned foundry building. Agricultural implements are made.

Maytag Washing Machine Co., Newton, Iowa, is building an addition to its foundry, 1-story 175 x 200 feet. F. L. Maytag is president. (Noted June 15.)

Best Universal Lock Co., Seattle, Wash., has bought a 4-acre site on East Marginal way where it will build a plant including a brass foundry.

Illinois Central railroad will build shops at Paducah, Ky. The plans are for three principle units, and will include a brass foundry 68 x 98 feet.

The plant of the Nevada Engineering & Supply Co., Reno, Nev., recently destroyed by fire, will be rebuilt at once. Roy Johnson is general manager.

Roberts & Mander Stove Co., Hatboro, Pa., has awarded a contract for two new buildings 60 x 140 and 35 x 65 feet to the Beling-Bush Co., Inc., Philadelphia.

Schmandt Foundry Co., 6401 Miller avenue, Detroit, contemplates constructing 2-story brick machine shop addition. Frank Teckner is secretary. (Noted July 15.)

J. S. Mundy Hoisting Engine Co., Frelinghuysen avenue, Newark, N. J., plans the construction of a 2-story, 40 x 110-foot plant, including a machine shop, pattern shop, etc.

Sterling Brass Co., 9600 St. Catharine avenue, Cleveland, is taking bids for constructing a 2-story, 40 x 125-foot plant and warehouse. A. Sogg, 3030 Euclid avenue, is architect. (Noted March 1.)

Federal Brass & Mfg. Co., formerly known as the Federal Mfg. Co., Columbus, has acquired a plant at Marysville, O., where it contemplates expansion and improvements. S. Van Etten, is secretary.

Kennedy Valve Mfg. Co., East Walter street, Elmira, N. Y., has awarded construction contracts to Lowman Construction Co., 312 Railroad avenue, for 2-story, 20 x 63-foot foundry. H. M. Lane Co., Detroit, is engineer.

Ferro Enameling Co., M. Horn, secretary, 4150 East Fifty-sixth street, Cleveland, has awarded contracts to Philip Kirschner & Co., 2914 East Seventy-fifth street, for a 2-story, 23 x 54-foot enameling room addition.

Kingsport Foundry & Machine Works, Kingsport, Tenn., has been incorporated with $25,000 capital by B. C. Pendleton, W. T. Jones, James Berger, B. H. Neal and B. K. Pendleton.

W. Fitzgerald Ltd., Hamilton, Ont., has been incorporated with $50,000 capital to manufacture hardware and builders' supplies by Walter F. Fitzgerald, Alexander R. Tarlton and Percy G. Moore.

Eureka Planter Co., Woodstock, Ont., is planning enlargement of its business and has bought the building formerly occupied by the Wayne Tank & Pump Co. which it will convert into a foundry.

Standard Sanitary Mfg. Co., Louisville, Ky., is contemplating constructing a $1,000,000 plant in the Bay district, San Francisco. The engineering department of the company at 1000 Bryant street, is preparing the plans.

Independent Foundry Derrick Co., Delaware, O., which purchased the Delaware foundry at this place some months ago, plans opening the recently acquired property which has been idle for some time.

Construction has been started on a steel foundry for Oil City Iron Works, Shreveport, La., adjoining its plant on Strand street. The capacity will be 10 tons of castings per day. H. C. Brewster is president.

Chelsea Foundry Co., Chelsea, Mich., has been incorporated with $10,000 capital to operate an iron foundry by Mary Louise Giberson, Mason B. Giberson and Philip E. Giberson.

Crane Enamelware Co., 1316 Chestnut street, Chattanooga, Tenn., is reported planning a $200,000 foundry and grinding building and installing equipment to manufacture enamel tubs, sinks, etc.

Blue Valley Brass Foundry & Pattern Works, St. Louis, has acquired a 50 x 135 foot site at Twelfth street and Bristol avenue and will erect buildings to manufacture brass and aluminum castings and metal and wood patterns.

C. L. Capps Co., 1224 East Adams street, Jacksonville, Fla., is reported as planning purchase of site in Glen Myra subdivision where it will construct new plant buildings, including brass and iron foundry and machine shop.

B. H. Pract, Martin building, Pittsburgh, engineer, is receiving bids for the construction of a 3-story, 100 x 506-foot brass foundry at Linhart, Pa., for the Westinghouse Electric & Mfg. Co., East Pittsburgh, at an estimated cost of $45,000.

John Rutkowski, 6600 Park avenue, Cleveland, has awarded contracts for constructing 1-story and basement, 75 x 120-foot foundry building at 6507 Sidaway avenue, to Vulcan Construction Co., 66000 Park avenue. A. Badwski, 7100 Broadway, is architect.

The property of the defunct McLouth Industries, Inc., Marine City, Mich. will be taken over and improved by the recently incorporated Marine City Motor Castings Co. of this city. George E. Kramer is general manager of the new company.

Plans are being completed by the J. S. Mundy Hoisting Engine Co., Newark, N. J., for the erection of a 2-story addition, 40x140 feet. The first floor will be used as a machine shop and the second, largely as a pattern shop.

James Stewart Mfg. Co., Ltd., Woodstock, Ont., has been incorporated to manufacture stoves, furnaces, ranges, boilers and water heaters with $200,000 capital by Edward W. Nesbitt, Allan W. Muir and Albert Karges. (Noted July 15.)

Pitts Foundry Co., Woodlawn, Ala., will begin operations immediately in the production of gray iron castings, wood and metal patterns, in the plant of the former American Blakeslee Co., Fifty-fourth street and First avenue. Alton V. Pitts is president and treasurer.

The steel shop of the Lenoir Car Works, Lenoir City, Tenn., was damaged here July 21 by a disastrous fire. All buildings except the woodshop and foundry were damaged beyond repair. Reconstruction will be started immediately according to Z. B. Wilson, general manager.

Wright Water Motor Co., Ltd., Toronto, Ont., has been incorporated to carry on the business of founder, mechancial engineer and to manufacture water wheels and other machinery, with $100,000 capital, by George McC. Willoughby, Harold L. Steele and Joseph M. Bullen.

Atlantic Foundry Co., Cleveland, has awarded contracts to David Gilchrist, Fourth avenue, Berea, O., for constructing 1-story, 30 x 100-foot brick pattern shop and office on West Sixty-ninth street. William H. Thilling, West Sixty-ninth street and the Wheeling & Lake Erie railroad tracks, is superintendent of the foundry.

Great Northern Tool & Supply Co., Billings, Mont., has been incorporated with $100,000 capital to take over the foundry and machine shop business conducted the past two years by J. C. O'Donnell, president, Midland Iron Works of this city. Shops will be removed from Shelby to Kevin, Mont., and additional equipment will be installed. Incorporators are L. C. Babcock, J. C. O'Donnell and H. C. Hayes.

Even the Detours Lead Back TO THE MAIN ROAD

> *I WONDER where that dog has gone—*
> *That cast-iron dog out on the lawn.*
> —Detroit Free Press.
>
> *And where's that public fountain fella—*
> *The cast-iron coon with the big umbrella?*
> —Cleveland Plain Dealer
>
> *We is gone wha de dodo 's at,*
> *Cahn't use statu's in a moderhn flat!*
> —The Cast Iron Coon.

DOUBTLESS the rhymes to the right indicate deep scientific interest rather than, as some might infer, merely idle curiosity. If one were inclined, he might make inquiry, research, I believe it is called these days, into the old-time, cast-iron fence, the Juliet balconies of the same enduring metal that hung below the front windows of the best Main street homes, and the well known foundry-made foot scrapers and bootjacks. Can you recall the latter, those interesting specimens of gigantic beetles, whose servile claws gripped your boot by the heel and by the operation known as leg pulling removed that elongated piece of footwear from your suffering feet?

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IF BARNUM, whose text is crowded from the page by the rhymes mentioned, were alive today, his up-to-date collection of objects of scientific and historical interest would include specimens of all these foundry products unknown to the younger generation. All served to promote the comfort or please artistic sense of our immediate ancestors. The moral which adorns this tale is that the necessities of today become the antiques and curiosities of tomorrow. One great trouble of our foundrymen is that they are manufacturing antiques in advance of their market, instead of stepping out in the front rank with a live line of necessities.

—: :—

CONGRATULATIONS are due the foundryman who sold to the city of Allentown, Pa., the attractive cast-iron flower boxes which grace their street lighting poles. Similarly the manufacturer who made the containers in which flowers are growing along the highway bridges in Terre Haute is entitled to credit. These uses of cast iron, while perhaps not unique, are new and offer suggestions, to other foundrymen who seek an outlet for their products. Instead of sticking to the beaten highway of industrial progress, rubbing hubs and jockeying for position with many competitors traveling in the same direction, they have explored new routes.

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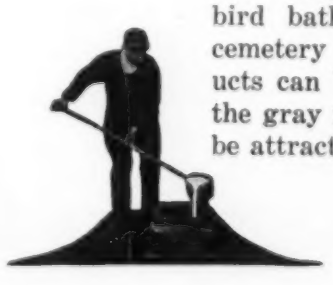
AN ASSOCIATION comprising manufacturers of monuments and similar objects to adorn the graves of those who have passed the portals of eternity just completed its convention in Cleveland. This organization, known as the Memorial Craftsmen of America, has improved American standards of cemetery appearance. A contemplated phase of its activity is to encourage through extensive publicity the marking of every grave.

One feature of some of the beautiful marble and granite memorials at the association's exhibition was the growing favor shown to cast-bronze ornaments and letters supplementing the effective use of engraved designs and letters. Similarly, an increasing tendency toward fountains, benches, urns for growing flowers and even bird baths is noted in modern cemetery planning. These products can be made economically in the gray iron foundry. They will be attractive and low in cost.



Phineas, Jr.